PUBLICATION OFFICES
168-177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York.
W. J. JOHNSTON, Editor and Publisher.
T. COMMERFORD MARTIN, JOSEPH WETZLER, Associate Editors.
G. H. STOCKBRIDGE, Assoc. Editor Patent Department.
CLARENCE E. STUMP, Business Manager.
WALTER T. HUNT, Advertising Dept.

New England Office, 48 Congress Street, Boston.
W. I. BARKER, Manager.
Western Office, 44 Lakeside Building, Chicago.
C. H. MACLILIE, Manager.

SUBSCRIPTION, IN ADVANCE, ONE YEAR, $3.
(Postage Prepaid in the U. S. or Canada.)

CLUBS.—In clubs of 4 or more, $2.50 a year each; with a free extra copy to the getter-up of a club of 8.
Subscription to foreign countries, $4 a year.
In requesting your address changed, give old as well as new address.

THE ELECTRICAL WORLD
HAS THE LARGEST CIRCULATION
OF ANY ELECTRICAL JOURNAL PUBLISHED, AND IS
THE BEST ADVERTISING MEDIUM.
W. J. JOHNSTON, Publisher,
Potter Building, New York.
OR EITHER OF THE BRANCH OFFICES.

CONTENTS.

ILLUSTRATED ARTICLES: PAGE.
A Novel Thermostat ... 266
The Daft Electric Railway at Asbury Park, N. J. ... 267
The Wildt Leclanche Battery ... 268
Calling Generators for Telephone Exchanges ... 269
The Russell Automatic Engine for Electric Lighting. 271

NEW BOOKS:
"Handbuch Der Elektricitaet und Des Magnetismus" ... 266
"Transactions of the American Institute of Electrical Engineers, Vol. IV." ... 266
"The Relative Proportions of the Steam Engine" ... 266

CORRESPONDENCE:
High Speed Telegraph Relays ... 266
Anticipation of the Hyer Motor ... 267
Charging a Metal Plate ... 268
Power Required for Incandescent Lamps ... 270
Another Wonderful Joint ... 270

EDITORIAL PARAGRAPHS ... 265

MISCELLANEOUS:
Electro Plating Organisms. 268
An Electric Fire-Damp Indicator ... 269
The Movement for Patent Reform ... 267

MISCELLANEOUS: PAGE.
Hering's Secondary Battery 267
Practical Analogies between Mechanical and Electrical Engineering—III. ... 268
The Besmazure Storage Battery ... 268
A New Voltmeter ... 268
American Institute Electrical Exhibition ... 270
The Lykens Valley Mine Electric Railway ... 270
The Recent Electric Light Combination ... 270
The Electric Light Not a Fire-Bug ... 270
The New Reckenzaun Car in Philadelphia ... 270
The Death of Sidney F. Shelbourne ... 271
The Cost of Domestic Electric Lighting ... 272

DEPARTMENTS:
New York Notes. ... 273
New England Notes ... 273
Philadelphia Notes ... 274
Western Notes ... 274
Southern Notes ... 274
The Telegraph ... 275
The Telephone ... 275
The Electric Light ... 275
Applications of Power ... 275
Personals ... 275
Stock Quotations ... 275
Business Notices ... 275
Miscellaneous Notes ... 276
Our Illustrated Record of Electrical Patents. ... 276

New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

PAGE.
Shaw & Geary.—Norway Iron Frame Bells ... vi
James W. Queen & Co.—Special Announcement ... ix
W. J. Johnston.—Chart of Wire Gauges ... x
The Edison Machine Works.—Insulated Wires, Flexible Cords and Cables for Telephone, Telegraph and Electric Light ... xiii
J. S. Mize.—The Stanley Faradic Battery ... xiv
John Stephenson Co. Limited.—Street Cars for Electric Motors ... xiv
H. E. & C. Baxter.—Annunciators and Electrical Goods ... xiv
Wants and Special Notices ... ix

VOL. X. NEW YORK, NOV. 19, 1887. No. 21.

IT must be evident to all who are observant of the signs of the times that great interest is felt in the movement for patent reform that was recently begun by the National Electric Light Association, and which is, in fact, but another stage in the expression of discontent now felt for some years past at the working of the patent system. We print on another page the bill that it is proposed to bring before Congress, providing for the appointment of a commission to examine into the patent laws and the working of the patent system, and to take steps for introducing any changes that may be necessary.

OUR list of new electric lighting and electric railway enterprises this week indicates that there is no falling off in the activity in these fields with the coming of winter, but that, on the contrary, the introduction of lamps and motors is going on with accelerated speed. In telephony and telegraphy, a like activity prevails, and it is marked in telegraphic circles that the business is very heavy for this season of the year. As many as 104,000 messages were handled recently in one day in the operating room at 195 Broadway, and yet it is but a few months since that 100,000 was regarded as an unapproachable figure.

THE electric railway is gaining ground very quickly. Some time since we recorded the success of the road in the Lykens Valley coal mine, and we now learn that a second contract has been made for the same mine, the electric motor in this case supplanting and replacing a steam locomotive, which had itself superseded mules. Moreover, the saving over steam, already exhibited in the first Lykens Valley illustration, has been very large.

IN connection with the execution of the anarchists at Chicago last week, and the troubles expected therefrom, our Western correspondent notes that there was no fear of interruption of communication from wire cutting, as the wires are all underground there. This is a pertinent consideration, though not altogether new. We remember that a year or two ago it was brought forward by General Molineux, we think, in this city, in an address before a gathering of military men. Wires thus put out of sight are much safer than those seen in mid-air, liable to any onslaught. At the same time it is tolerably clear that a city where the mob had obtained such control as to cut all the wires would not be in a condition to care very much whether the wires were up or down; and besides, with the present multiplicity of circuits, there would be a wide alternative of routes between any two points, even if every wire running directly between them had been cut or destroyed. Still the point is one for civic authorities to bear in mind.

TELEPHONIC investigations are becoming very much of a bore. They go on all over the country, and, as far as we can observe, they never elicit anything very new or startling. Everybody knows that the American Bell Telephone Company exacts a certain rental that is high, and everybody knows that the company would rather cease business in any State or locality than take less than a good round royalty. We are among those who think this royalty too high, but we see no valid argument against the insistence of the company on its own business policy. We believe it could make more money at lower rates, and be in better odor with the public, but if the company, protected by its patents, chooses to insist on its rights, to its own detriment, we really do not see what is to be done about it. People who are discontented have the option of letting the telephone alone and going without it; and to judge from the ecstasies of the press in some places, "ordering out" one's telephone is a distinctly new joy, an addition to the pleasures of life. All these legislative inquiries strike us as solemn farces; perhaps they "strike" the telephone companies somewhat differently.

NOTE was made on this page recently of the fact that, as far as the operators were concerned, government telegraphs in England had not proved to be exactly a panacea. This point is emphasized by what we find in the latest number to hand of the English *Telegraphist*, and what can be read in almost any number of that excellent periodical. Thus at Cardiff: "The meagreness of the promotions has given great disappointment." At Edinburgh: "The expectant men are still on the rack. We sympathize with Belfast in their kindred position, and we ask those who have cruelly suffered at that office to remember what has taken place here, and to console themselves with the thought that the present system of promotion is not regulated by individual merit and rotation." At Liverpool: "The case to be presented to the Royal Commission by the provincial telegraphists is being printed in book form." At Newcastle: "A considerable number of clerks have been induced by higher salaries and better prospects to push their fortunes abroad." The same November issue also contains part of a hot correspondence about favoritism at Birmingham. Altogether things are not as cheerful as they might be.

THE recent advance in the price of copper after a period of depression has attracted some little attention, and it is noteworthy that the growing demand for copper in electrical applications is credited with bringing about higher prices. Discussing the situation, the *Industrial World* remarks: "The reaction from these periods of small production and low prices which has recently been manifested may have been caused in part by speculation, but a much more potent cause has been the demand from manufacturers in the line of their legitimate business. Electrical appliances have been on the increase recently on a large scale, and as copper is not only an excellent conductor of electrical currents, but very durable compared with iron or steel, its commercial value is likely to be advanced, and the advance maintained." Unquestionably the development of electrical industries and appliances has been one of the causes stimulating the production of copper, and it would be a serious thing to have the price so high as to restrict electrical work. The rise from 10 cents to 13 is not a small one, and we would rather see a rate prevail that would encourage the use of electric light and power. In fact the resort to currents of high potential seems to have gone as far as it can be allowed under existing conditions, and no doubt one reason for such potentials is the cost of leads containing copper enough to carry currents of more volume and lower electromotive force.

MR. WATTS in concluding his series of analogies draws attention to modes of regulation of dynamos, and his suggestion that the regulation of the engine ought to be governed electrically is well worthy of attention. Several such methods are already in existence and their performance is highly satisfactory. As regards the method of varying the speed of dynamo and engine according to the work to be performed, this is quite applicable to dynamo machines in which the strength of the magnetic field remains practically constant with all loads, but in machines where this is not the case, such as the shunt and compound, whose regulation by the field coils is designed to be automatic, constant speed under all loads is essential. Hence a variation of the engine speed is not permissible in these. Again, while a series machine might work with equal economy at reduced speeds, it is doubtful if an engine designed for high speed would perform its work with equal economy at a slower speed, because, even admitting the regulation to be effected by a variable cut-off, the cylinder condensation would be greatly increased and would probably equal in amount that caused by "wire drawing" with a throttling governor.

IN another column we note the formation of a company to utilize the power of Niagara Falls for conversion into electricity, which is to be distributed generally over long distances, a thousand miles being spoken of. Thus is revived a scheme which has been before the engineering world ever since the reversibility of the dynamo as a motor was demonstrated. Inviting as the scheme looks, it cannot be denied that it presents serious difficulties, and its success will depend entirely upon how high an electromotive force can be employed. The highest potentials now carried on arc lighting circuits are insignificant compared with those which would have to be employed to transmit considerable power economically over but comparatively short distances, and a profitable transmission over one thousand miles seems at present chimerical and indeed scarcely necessary in the present condition of fuel supply. The experiments of Marcel Deprez showed this pretty conclusively, and in the long run for a successful solution of the problem we must look to a method in which high electromotive force can be successfully handled. Involved in the problem is that of insulation, not only of the line, but of the dynamo, and the latter will require especial attention. It has already been suggested that, in order to lessen the danger of high potential in a single dynamo, the required high potential should be attained by the use of a number of dynamos placed in series, each developing a part. In connection with this subject, the distribution of the transmitted power at the receiving end will also demand attention, for it is evident that such wires carrying these high potentials cannot be brought into the premises of consumers. It is probable, therefore, that the double wound motor dynamo will here come into prominence for the purpose of reducing the potential to the required degree.

As already noted by us, the Board of Electrical Control of this city, organized for the purpose of burying electric wires, is now, anomalous as it may seem, debating the question of the best type of pole for supporting overhead wires. This discussion has been brought about by various considerations. It is apparent that it will take a long time before the underground system can become comprehensive, and hence, in order not to prevent the spread of electric lighting, the board is willing to authorize the erection of poles to carry the electric light wires. But there is reason to believe that not a few of the poles authorized to be erected will remain permanently necessary, even after the completion of the subways, to support the lamps themselves and for local distribution of the wires. The pole being then evidently a fixture, the board has been debating the question of the type of pole to be adopted, and after hearing arguments in favor of wood and iron poles, has decreed that the pole shall be 20 feet high. Of this distance 7 feet from the surface of the ground is to be iron, and above that of hard wood. This construction, which is by no means a new one, has been in use in this city for a number of years, and seems to meet the objections which have been brought against constructions in which only one material is used. But the question which was raised as to the relative immunity from danger of iron or wood still remains as it was before, and as we have already remarked in these columns, it would be well to compare the experience of a large number of those engaged in electric lighting. The local board seemed to be of the opinion that iron poles were objectionable to the companies only on account of their increased cost. We hardly think that this reason is a governing one by any means, particularly as one of the companies in this city stated its willingness to pay the difference in cost to any charitable institution if allowed to use wooden poles, which it deemed alone safe. In view of the fact that it is admitted that poles will be used with the underground system completed, the subject is one of peculiar interest.

NEW BOOKS.

HANDBUCH DER ELEKTRICITAET UND DES MAGNETISMUS FUER TECHNIKER. By Dr. O. Froelich, Berlin. Julius Springer. 1887. 2d edition. 6 × 9; 508 pp.

This work constitutes the second edition of the second volume of Dr. Zetzsche's *Handbook of Telegraphy*, written by the author in 1878, and now appears as the *Handbook of Electricity and Magnetism for Technologists*. The contents, as far as the arrangement of matter and method of treatment are concerned, have remained essentially the same; the details, however, have been revised, improved and conformed to the present state of the art.

While in the first edition attention was given almost entirely to telegraphy only, there being at the time but few other important applications of electricity, in this edition telephony and the dynamo-machine are entered upon, and, therefore, the entire range of modern electrotechnics is epitomized. The work consequently addresses itself to all to whom the study of electricity is of value.

The principal idea adhered to is that both exposition and theory are entered upon only so far as is possible without calculations and precise research, but all matters presented are followed up minutely and investigated.

The book is divided into the following chapters: The Electric Condition, Sources of Electricity, Constant Currents, Behavior of Bodies in Relation to the Current, Effects of Current, Magnetism and Electro-magnets, Electro-magnetic Apparatus for Alternating and Continuous Currents, Phenomena in Cables, Instruments for, and Methods of, Electrical Measurement, and the Absolute Unit System.

The principal point pervading the whole book is the theory of potential, which is clearly elucidated. In the sub-section on galvanism, the "contact theory" is held to strictly, and all of the phenomena of the production of galvanic currents accounted for, in contradistinction to the chemical theory of the seat of electromotive force.

Although the work is to be commended as an elementary text book, still it can hardly be said to fulfill the author's claim and intention, as set forth in the preface to the first edition, of being a work of reference to date for practical men connected with the art. Thus, reference is made to but one form of arc lamp; the practical uses of the storage battery are not touched upon; but bare mention is made of the application of alternating currents by converters to lighting purposes, and not even a paragraph or cut is afforded of the incandescent lamp. As to the telephone (of which Reis is given the credit of discovery and Bell merely that of its elaboration), only the principles of its operation are given, without any data as to practical application.

The author in the preface naively remarks: "Of instruments of measurement, almost only such as are constructed by Siemens & Halske are mentioned. I hope that this will be found natural, as I have worked in that department of this firm for some time, and it can be made the duty of no author to prefer the opinions of others to his own."

This limiting of text and illustrations to the above manufacturers' work is not only true of measuring, but all other practical apparatus, neither French, English nor American practice being referred to except in most meagre terms. The book is peculiarly free from typographical errors, there being no list of errata so annoying in most foreign works. This makes it all the more strange that on page 144, in the table of the amount in grammes deposited per ampère-hour, of various elements, zinc should be quoted at 1.174, instead of 1.213, the new determination: and magnesium 0.446 instead of 4 475; while on page 205 the coulomb equivalent of copper is given at 0.00328 gr., instead of 0.000327 gr.

The style of the work is clear and readable, and the cuts, as is usual in most German technical books, excellent.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Vol. IV. Published by the Institute, New York. 33 Illustrations, 232 pp.

The present volume of the Transactions of the Institute is an admirable publication, reflecting favorably, not only upon the Institute as a scientific body, but upon the secretary, Mr. R. W. Pope, upon whom devolves the duty of editing the contents. The papers included deal with such subjects as "Incandescent Lighting from Central Stations," "Electric Street Cars," "The Practical Requirements of Small Motors," "Distribution of Electricity by Secondary Generators," "Storage Batteries in Practice," "Differing Temperature Coefficients of the Different Coils of a Fine Rheostat," "The Relation between the Cross-Section of the Iron in Armature and Field of the Gramme Dynamo," "Novel Phenomena of Alternating Currents," "A Few Comparative Statistics of Electric Railways," "Central Station Construction," "On the Change from Negative to Positive of the Temperature Coefficients of Some Carbon Filaments;" "Lead Encased Conductors," "The Electric Lighting of Passenger Trains." The list, it will be seen, embraces all the freshest topics, and the themes are handled very exhaustively by well-known electricians, bringing out discussions of great interest and importance. Such a volume is an earnest of the intention of the Institute to carry on, with growing benefit to the profession, the work which it has done unobtrusively but steadily throughout the last four years, and which it is evidently able to perform with credit and success, entitling it to all support in the field it represents.

A word of special praise is due for the excellent steel portrait of Dr. Norvin Green, who was president of the Institute in 1884-5-6, and whose active interest in it, amid his own heavy duties, has been very helpful and encouraging.

THE RELATIVE PROPORTIONS OF THE STEAM ENGINE. Third edition, revised and enlarged. By William D. Marks. Philadelphia: J. B. Lippincott Company. 1887. 295 pp. Price, $3.

Those who have derived benefit from Prof. Marks' first edition of the "Steam Engine," published in 1879, will be greatly pleased to see the large amount of additional matter contained in the present volume. While in the earlier editions the individual parts of the engine alone were treated of, this latest edition contains valuable discussions on the action of the steam itself and its influence on the proportions of the engine. Cylinder condensation especially has been thus carefully analyzed and may now be said to have been almost reduced to a determinate factor. Prof. Marks takes up each part of the engine in succession, and by comparing the best practice with the results that theory would dictate, evolves formulæ that can be readily applied to any design. This is one of the few comprehensive works in the English language dealing with this subject and it embodies in a condensed form valuable information usually scattered and difficult to assemble.

The volume is well printed and is made additionally valuable by the interleaving of blank pages, upon which new data in relation to the subject may be recorded.

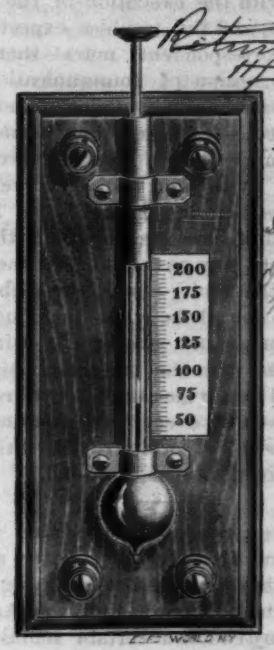


FIG. 1.—A NEW THERMOSTAT.

A Novel Thermostat.

There are numerous situations in which it is desirable to maintain a uniformity of temperature, not only for ventilating purposes, but in many manufacturing operations.

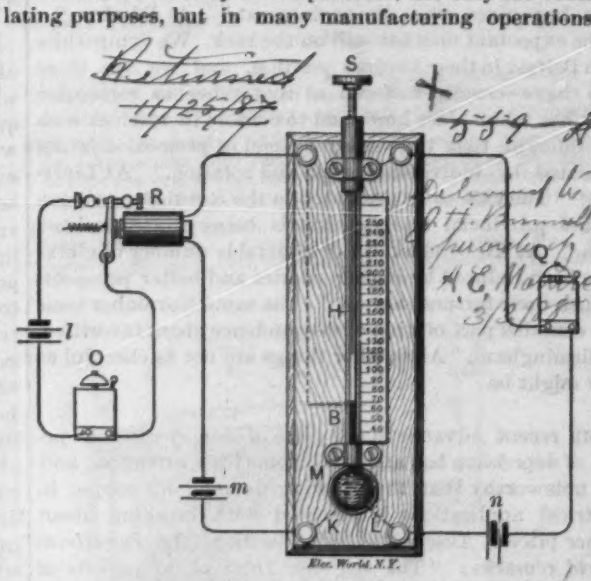


FIG. 2.—A NEW THERMOSTAT.

In some cases a certain temperature must not be exceeded, while in others it must not fall below a critical point. In order to combine both types of instrument in one apparatus, Mr. Albert E. Morrison, one of the staff of the Anglo-American Telegraph Co., at Charlottetown, P. E. I., has devised the thermostat, shown in the accompanying illustration, Fig. 1.

As stated above, this thermostat is arranged for indication of excess of temperature, so that it may act to give a fire alarm. Its arrangement for this purpose is shown in the diagram, Fig. 2. As will be seen, a screw *S* is fixed to the top of the thermometer tube, and at its end it carries a platinum wire *H*. By turning the screw the end of this wire can be brought to any desired point on the thermometer scale. It will also be noticed that a connection is made with the mercury in the bulb *M*. A battery *n* and bell *Q* are interposed in this circuit, which ends in the screw, and which is normally open. But when from any cause the temperature increases to such an extent as to cause the mercury to rise to the platinum wire *H*, the circuit is closed and the bell *Q* sounds an alarm, which can, of course, be transmitted to any distance.

In order to indicate a fall of temperature below a certain limit, a contact is fused into the thermometer tube at *B* and connected through the upper left-hand binding-post with a battery *m* and relay *R*, the circuit being completed through the mercury contact *K*. Normally the mercury stands above the point *B* and the circuit just described is closed, so that the lever of the relay is on its front contact. If now the temperature falls so as to bring the mercury below the contact *B*, the circuit will be opened and the lever of the relay will fall to the back contact and close a local circuit, including the bell *O* and battery *l*, thus giving an alarm.

The apparatus, which has recently been patented by Mr. Morrison, is a very simple one and allows of a wide and accurate range of temperature regulation.

Electroplating Organisms.

A new process of electroplating natural objects, such as animals, flowers and tissues, has, says *Engineering*, been brought out in France. The process is described as follows: An albuminous liquid is obtained by washing some slugs or snails in water to clean them, then placing them in distilled water until they give off their albuminous matter. This is filtered and boiled for an hour, then distilled water is added to make up for that lost by boiling, and also about 3 per cent. of nitrate of silver. This solution is then kept in bottles, hermetically sealed, and in a dark place. When required for use about 30 grammes of the liquid are mixed with about 100 grammes of distilled water, and into this solution the objects to be electroplated are immersed for a few moments. They are then put into a bath consisting of about 20 per cent. of nitrate of silver dissolved in distilled water, and afterwards submitted to the action of sulphuretted hydrogen gas which reduces the nitrate of silver on the albumen-coated object. Thus treated an organic object becomes fitted to receive the electro-deposited metal intended for it; and the layer is said to be of superior fineness to that produced by the other known processes for coating natural objects with metal by galvano-plasty. It shows the texture of the object with much delicacy.

An Electric Fire-Damp Indicator.

At the meeting of the British Association at Manchester, Mr. J. Wilson Swan read a paper on the fire-damp indicator he has devised. It will be remembered that the author exhibited at the Aberdeen meeting an electrical miners' safety lamp, and in the discussion which followed the objection was raised that with the use of that apparatus the means of learning the presence of fire-damp, that exists with the ordinary safety lamp, would be lost. In answer to this Mr. Swan produced at the last Birmingham meeting a lamp with a fire-damp indicator attached. The apparatus shown at the recent meeting was an extension of the principle formerly described. The device consists of a portable battery and a combustion apparatus; the two being connected either fixedly or by a flexible conducting cord. The principle on which the meter acts is, that if a mixture of air and fire-damp is burnt, the volume of the mixture is diminished in proportion to the amount of fire-damp present; the pressure and temperature remaining constant within limits. The combustion tube of the apparatus is opened to the atmosphere of the mine and becomes filled. The two stop-cocks attached are then closed and a spring is pressed, when the circuit will be completed. At the same time the tube is closed to the atmosphere. Within the tube is a platinum spiral, and this becomes red hot, when, if any fire-damp be present, combustion will take place. On breaking the circuit by removing the pressure from the spring there will be a rise of liquid in the gauge tube. Supposing the contact has been kept up long enough to effect perfect combustion, and time be allowed for the apparatus to return to its initial temperature, the percentage of gas in the mixture will be correctly indicated by the graduations on the tube. The time necessary to effect complete combustion is about 2½ minutes. For rough measurements complete combustion is not necessary, and with a battery fully charged 20 seconds will be sufficient. For exact measurements the effect of temperature must not be overlooked, and it is necessary to let the apparatus return to the initial point, or else make due allowance.

High Speed Telegraph Relays.

To the Editor of The Electrical World:

SIR: In your issue of Nov. 5 appeared an article entitled "High Speed Telegraph Relays," by Stephen D. Field, in which the illustration is identical with the arrangement shown in my application for United States patent, upon which an interference case was tried in Washington, D. C., several years ago. SIMEON J. M. BEAR.

CHICAGO, Nov. 10.

The Daft Electric Railway at Asbury Park, N. J.

This road, which is locally known as the Seashore Electric Railway, commenced running early in September and has been in uninterrupted operation ever since.

The road may be described as a double track belt line, which, when completed, will be about four miles in length. It starts from the railway station and runs down Cookman to Kingsley avenue, the present terminus. The remainder of the route, which will be finished during the coming winter, follows Kingsley to Eighth avenue as far as Emery street, to which it keeps until Asbury avenue is reached. Then along Asbury to Main street and through Main street to its starting point, the railway station.

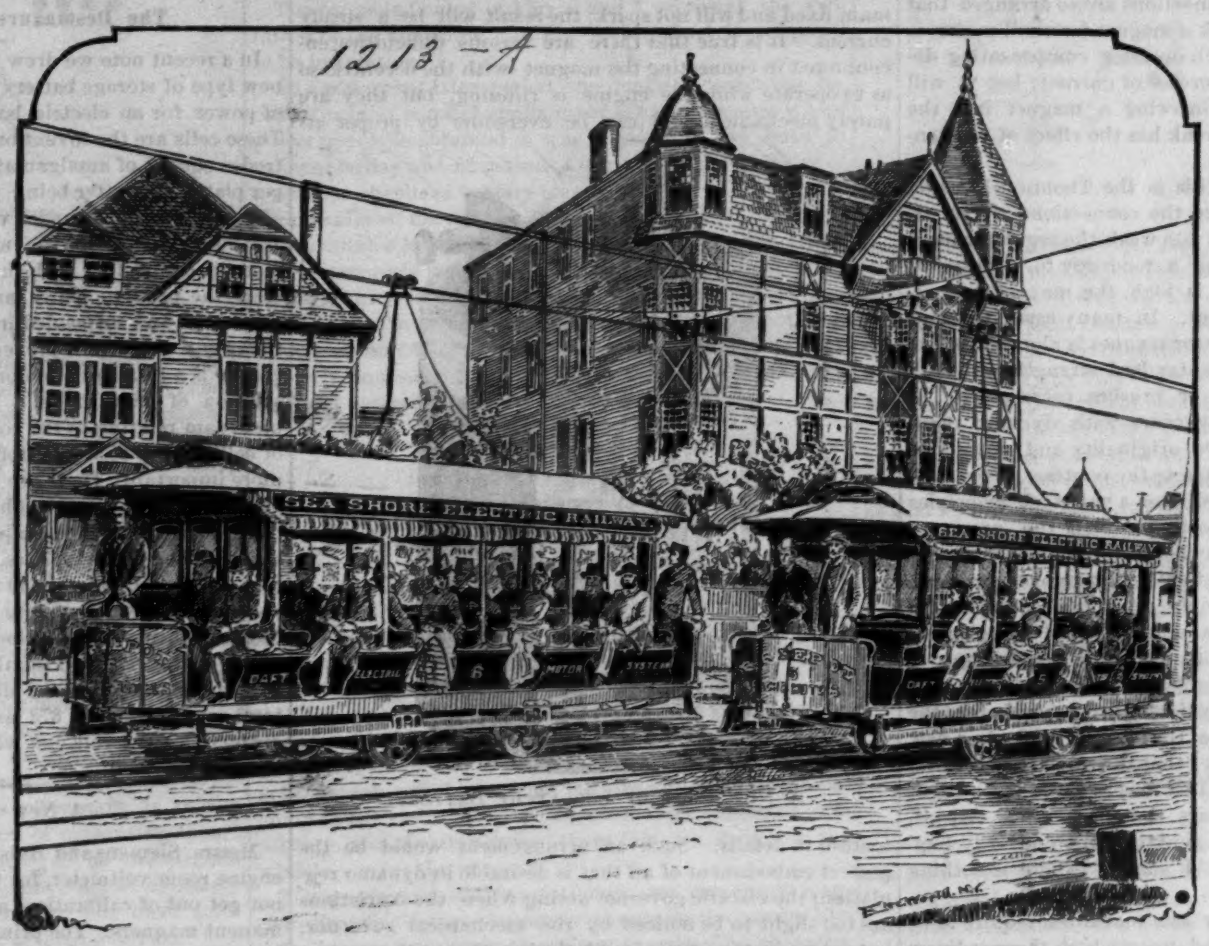
The Daft overhead system of conduction is used, as shown in the accompanying illustration, and while by no means have the best example of its kind is as inexpensive and serviceable as could be desired. Poles along opposite curbs sustain stout wire ties, to which short spars bearing the insulator are attached, and the double conducting wires are strung through these. The outgoing current traverses one wire and the return current passes over the other. Communication with the motive machinery of the car is made by means of a trolley riding on the double wires and connected by insulated conductors to the starting gear of the car, which it follows as it moves to and fro. Opposite wheels of the trolley are insulated from each other and the current from one wire passes through them to-the car motor, and returns by the opposite wheels and other wire to the dynamo generator.

The conductive system is fitted with switches, sidings, etc., and every convenience for handling the cars in all situations, and is, in fact, an aerial counterpart of the tracks on which the cars run.

The stationary plant consists of a steam engine of 125 h. p. and at present one dynamo-generator of 50 h. p. Another will be added very shortly, but is not likely to be called into use until the influx of summer visitors necessitates the running of more cars.

The total rolling stock consists of fifteen cars, eleven open summer cars and four closed ones for winter service, and each has sufficient power to tow another of the ordinary type fully loaded in addition to itself. This feature is a valuable one in the event of any unexpected demand for transportation above the regular traffic of the line.

The stationary plant and motive equipment are said to be very good, and although the line involved peculiar difficulties of construction, it is performing its functions effectively and to the satisfaction of all concerned.



THE DAFT ELECTRIC RAILWAY AT ASBURY PARK, N. J.

The Movement for Patent Reform.

It is evident from the feeling manifested in many quarters, that the importance of patent reform is keenly appreciated. To this fact our own columns have recently borne witness in articles and communications, and the winter now promises to be productive of good work in bringing about reforms that are needed. In regard to the movement started by the National Electric Light Association, the legal committee of that body, composed of Messrs. J. F. Morrison, W. C. Kerr, F. J. Sprague, F. Ridlon and A. Steuart, has issued the following notice or appeal:

To the Members of the National Electric Light Association:

The legal committee, who have in charge the presentation to Congress of the bill for reforms in the patent system adopted at the August meeting of the association, request that the members of the association respond to the call made upon them for funds with which to conduct the canvass of the members of Congress in the interest of this bill.

The burden cast upon the legal committee in prosecuting this bill before Congress is a heavy one, involving the expenditure of a very great amount of both time and labor, but both time and labor will be expended in vain unless the members of the association hold up the hands of the committee, and supply the "sinews of war." The committee have addressed all of the members of the association, requesting from them certain service in influencing the members of Congress from their immediate districts, and have asked that the members respond to this letter. It is very important that the committee should not be left in the dark, but should know exactly how much force they can count upon. For this purpose, they request that the members write them at once whom, of the members of Congress, they can expect to influence in favor of our bill.

The committee have published the first of a series of pamphlets upon reforms in the Patent Office. This will be followed by others, one of which will contain articles by ex-commissioners of patents; and we hope to print in one of them some of the views of the judges of the United States courts, and still another by gentlemen familiar with the influence of our patent system upon our national growth and the development of our industries, especially the electrical. For this purpose some money is needed, and we hope that the members of the association will appreciate the great importance of the subject entrusted to this committee, and give it their aid required.

Subjoined is the bill which it is proposed to bring before Congress:

A Bill to Establish a Commission to Revise the Patent Laws of the United States.

BE IT ENACTED, By the Senate and House of Representatives of the United States in Congress assembled:

SECTION 1. There shall be a commission to revise the patent laws of the United States, consisting of one chief commissioner and two (or four) associate commissioners; who shall be appointed by the President of the United States; and who shall hold office for one year from and after the date of their commissions; and who shall receive for their services a compensation of $5,000 each.

SECTION 2. It shall be the duty of the said commission to hold public sittings in Washington City, during thirty days at least, unless speakers are sooner exhausted, and to listen to whatever speakers ask to be heard on the topics within the jurisdiction of the commission, and to receive and consider all printed statements and arguments that may be duly delivered to the commission, relevant to those topics, and to invite communications from all the justices of the Supreme Court, and all the judges of the Circuit Courts and District Courts of the United States, and of the Supreme Court of the District of Columbia, and also from the commissioner of patents, and the examiners-in-chief, the examiner of interferences and the other principal examiners of the Patent Office, on the subjects before the commission, and to receive and consider such communications as may be duly made to the commission in pursuance of such invitations. And the commission may require reports in writing from the commissioner of patents relevant to any fact or facts touching the rules of practice of the Patent Office, and the several commissioners may have access to all the books and periodicals in the Patent Office library.

SECTION 3. The commission shall thoroughly examine the present patent laws of the United States, and compare them with the patent statutes of other countries, and thoroughly consider them in respect to their practical operation upon the progress of the useful arts, and upon the rights and interests of all classes of American citizens, and shall thereupon draft a bill for an act to revise, amend and consolidate all those statutes of the United States that relate to the organization or operation of the Patent Office, or to the granting or repealing of letters patent for inventions, or to the rights, remedies, duties or penalties which relate to such letters patent; and shall transmit that draft, together with a report of its doings and conclusions, to the Secretary of the Interior, to be by him transmitted to the Fifty-first Congress, at the beginning of its session.

SECTION 4. The commission is hereby authorized to employ such clerical aid and to incur such other expenses for room rent, books, stationery, printing, postage, etc., as it finds necessary for the proper performance of its duties, and to receive reimbursement for the actual traveling expenses of its members incurred between their respective residences and Washington, on account of their duties as commissioners as well as their actual hotel bills in Washington during their official stay in that city.

SECTION 5. The compensation and reimbursement due to the members of the commission, and the expenses incurred by them in pursuance of the authority of this Act, shall be paid from time to time by the Secretary of the Treasury, out of any money not otherwise appropriated, on the certificate of the chief commissioner, approved by the Secretary of the Interior, that such compensation or reimbursement is due, or such expenses have been incurred, as the case may be.

Hering's Secondary Battery.

In a patent recently issued to Mr. Carl Hering, of Philadelphia, the inventor describes a new method of preparing the plates of secondary batteries. When the plate has been prepared with the plastic active material, it is usually allowed to dry and become hard before being formed. When it is immersed in the liquid to be formed, the active material rapidly absorbs the liquid and is liable to be disintegrated and loosened from the plates. In order to avoid this action, Mr. Hering employs a binding material, consisting of a stable lead salt, which will not dissolve in the sulphuric acid of the cell, and being a lead salt it is ultimately converted into lead peroxide or metallic lead.

For that purpose the inventor mixes the dry oxide with a solution of a lead salt, such as lead nitrate and sodium plumbate, until the whole forms a plastic mass. This mass is then applied to the grid or plate, and when dry it forms a hard mass of about the consistency of chalk. On immersing it into the sulphuric acid for charging, it retains its coherency, and has no tendency to disintegrate or fall to pieces.

When used for the cathode or spongy lead plate, it is said to even adhere strongly to the flat surface of a sheet of lead. For this purpose the oxide of lead is mixed with a soluble salt or compound of lead, so as to form a plastic mass. This is then dried, the soluble salt crystallizing out during the process of drying, and forming a hard mass, including the oxide. This, during the process of forming in sulphuric acid, is not redissolved, as it is well known that crystals of soluble salts of lead are not soluble in sulphuric acid.

As there is no essential chemical action requiring time, the plastic masses may be dried quickly, as in an oven, thus saving much time, and the forming current may be quite strong, thus reducing the time of forming. Hard conducting homogeneous and self-sustaining anodes or peroxide plates, discs or cylinders may readily be made of any shape or form, and having any desired kind of surface. Masses so prepared and formed are said to have a remarkable degree of hardness and strength when oxidized to peroxide, at the same time having the necessary porosity.

In order to obtain sufficient porosity in the active material, Mr. Hering adds to the active material when in a plastic state a chemically inert soluble substance, such as sugar, which, after the mass has hardened and set, is dissolved out, leaving the mass porous.

Anticipation of the Hyer Motor.

To the Editor of The Electrical World:

SIR: In your issue of the 12th inst. you illustrate and describe a motor now on exhibition at the Electrical Exhibition of the American Institute by Mr. W. E. Hyer, of Newburg, N. Y.

If you examine the machine closely you will find that it is almost an exact copy of a machine invented by me and illustrated in THE ELECTRICAL WORLD of March 12, 1887, and all the "novel features" in the Hyer machine are contained in my machine as there shown. In fact the only difference seems to be that Mr. Hyer uses a disc commutator, while the illustrations of my machine referred to show a cylindrical one.

The Hyer machine is clearly an infringement of my patent No. 358,340, issued Feb. 22, 1887, and which covers all styles of machine in which the armature is inclosed in the field coils.

R. EICKEMEYER.

YONKERS, N. Y., Nov. 10.

Practical Analogies Between Mechanical and Ele c trical Engineering.

BY H. FRANKLIN WATTS.

III.

Nearly all engine governors and dynamo regulators are open to the disadvantage that they do not act until the action takes place that it is their very function to prevent. Thus an ordinary engine is designed to prevent the speed from changing; yet the governor is entirely inoperative unless a change of speed actually takes place. The same is true of nearly all dynamo regulators, though in a less degree. In both cases the best regulator is the one that is the most sensitive and will operate with a minimum of variation. It is evident that the proper position of a regulator is upon some convenient portion of the machine to be regulated. Steam engineers would not think of placing their governors anywhere else; yet we frequently see dynamo regulators placed in all sorts of out-of-the-way places, oftentimes upon an uncouth box at a distance from the dynamo, with its arrangement of switches, pole-changers, small motors, worm gears, resistance coils and other paraphernalia, which in many cases occupy more space than the arc machine it is designed to regulate. In designing electrical apparatus of any description, the electrical engineer should be ever mindful that "simplicity is the mark of a great invention." In a number of regulators known to the writer, the connections are so arranged that when the current is too weak a magnet (or small motor) is thrown into the circuit, which operates compensating devices and brings about an increase of current; but it will be seen that the very act of throwing a magnet into the circuit when the current is weak has the effect of weakening it still further.

In beautiful contrast to this is the Thomson-Houston method of regulation. Here the connections are so arranged that if the current is too weak the regulator magnet is "cut-out," thus having a tendency to increase it. So, also, when the current is high, the magnet is "cut-in," thus reducing the current. In many cases this cutting in and out of the regulator magnet is alone sufficient to maintain the current at its standard strength, although no movement of the magnet or brushes takes place. In comparing steam-engine governors with dynamo regulators in the search for pure originality and novelty of principle, one cannot fail to note the contrast, since electric regulators are constructed upon a variety of principles —by brush movement, short circuiting the armature coils, shunting the field, by a rheostat in the field, etc.,— while there is scarcely a practical engine governor in use that operates upon a principle other than centrifugal force. I have myself scores of times read in scientific papers glowing accounts with elaborate illustrations of steam-engine governors "embodying an entirely new principle of action." As many times have I eagerly read the description in the vain hope that it *did* "embody a new principle," but alas, I discover that the same fundamental idea used by James Watt in 1774 has received but a slight modification in the 113 years that have since elapsed. "Originality is the mark of genius." Involuntarily I appreciate the truth of the old adage, "There is nothing new under the sun."

All incandescent and a few arc machines require to be run at a steady, uniform speed, upon which the steadiness of the light depends.

A method of regulation which, as a matter of course, is *known* to electricians, but fully recognized by very few, consists in electrically controlling the speed of the driving engine to suit the requirements of the circuit, whether constant current or constant potential. Steam engineers would consider it very uneconomical to use an engine out of proportion to the work, as, for instance, to run a 1,000 h. p. engine when the work requires but 75 or 100 h. p.; yet this is no more wasteful or absurd than what electricians are constantly doing in the running of large arc machines at full speed while feeding but a few lights. It must be remembered that in steam engines, as also in dynamos, the coefficient of economy is not a fixed quantity but a variable one, increasing almost directly with the load thrown upon the engine or dynamo. Electric governors have many advantages over centrifugal ones. 1. They are more prompt in their action. Few ball governors can maintain the speed constant to within 5 per cent., notwithstanding the claims of the different makers. Electric governors have been known to regulate to within 1½ per cent. of absolute speed, even down to the short circuiting of the machine. 2. By the use of electric governors the wear and tear of both engine and dynamo is reduced to the limits of absolute necessity. 3. By their use the efficiency of both engine and dynamo is rendered constant or nearly so at all loads. Furthermore, in nearly all arc machines it is absolutely dangerous to run them continuously with but a few lights. Suppose that a thirty light machine, with open armature coil, is run at full speed when supplying but five lights. The armature coils are in series with the lamps only while passing the neutral field, or when very near it. When passing the "point of maximum induction," the coils are short-circuited upon themselves, which reduces their resistance to a minimum, while their E. M. F. is at its maximum; the result is that a heavy current flows through the short-circuited coils and beyond the capacity of the conductors, and, as a natural result, the armature heats badly. It will be seen that it is very desirable to maintain the brushes at a fixed position, but to do so under the above conditions would result in the burning out of both machine and lamps. The only alternative is to reduce the speed of the dynamo, and here the advantages of the electric governor are apparent.

The objection usually raised against the electric governor is that one engine drives more than one dynamo, which must be connected in single circuit to effect such governing. With arc machines this is objectionable, but with shunt machines there appears to be no good reason why the electric governor should not be used more extensively.

Why do not some enterprising engine-builders design an electric governor to be used in connection with or independently of the ordinary governor? In the Thomson-Houston and American systems of arc lighting, this could be brought about as follows:

Remove the large regulating magnet from the machine and allow the brushes to drop. Then connect the magnet with the eccentric of the engine in such a manner that the attractions of its armature will lessen the throw of the eccentric, effecting an earlier cut-off. The attraction of the armature is opposed by a spring which can be adjusted to a nicety. In the Thomson Houston system, the magnet would still be under the influence of the wall controller and have the usual dash-pot attached. The brushes can remain fixed and will not spark; the result will be a steady current. It is true that there are serious difficulties encountered in connecting the magnet with the eccentric so as to operate while the engine is running, but they are purely mechanical and can be overcome by proper attention to details. Such an arrangement would be the perfect embodiment of all that is desirable in dynamo regulation; the electric governor acting when the variations are too slight to be noticed by the mechanical governor, but acting in conjunction with the latter when the changes of current or potential are sudden or excessive.

A NEW FORM OF LECLANCHE BATTERY.

The indicator diagram now used by nearly all practical engineers enables the engineman to judge very accurately the qualities of the engine, the point of cut-off, the degree of expansion, general efficiency, etc. So, also, the "characteristic curve" of a dynamo enables the electrical engineer to arrive at the true merits of any type of dynamo. The "indicator card" or "diagram" is obtained by means of the indicator, while the characteristic curve of a dynamo must be plotted by hand. I am not aware that a dynamo has ever been made to draw its own characteristic. The difficulties are both of an electrical and mechanical nature, the principal one being that a pencil attached to the needle of an ammeter or volt-meter, and bearing upon paper with sufficient pressure to leave a perceptible trace, would destroy its sensitiveness as such. But here the idea used by Sir William Thomson in his siphon recorder can be utilized to good advantage. In this instrument the needle does not come in continuous contact with the paper, but is constantly separated a slight distance, across which small quantities of ink are ejected by electric action. It is safe to predict that the time is not far distant when the dynamo-machine will draw its own characteristic just as the steam-engine indicator now produces its own diagram.

In conclusion, I wish to impress upon the electrical fraternity the great desirability and importance of establishing a system of electrical inspection for the purpose of examining young men in electrical engineering and giving them a certificate of their proficiency.

At the recent convention of the National Electric Light Association, at Boston, a very able and original paper was read by Mr. E. R. Weeks, upon "Electrical Education," of which the following is an abstract: "Municipalities should appoint boards of examiners, whose duty it should be to inquire into the competency of electrical employés, especially those of light and power companies, as ignorance and poor workmanship here endanger life and property. Line and station foremen should be licensed, as their duties are fully as responsible as those of stationary engineers. By such legal measures faulty construction will be prevented, and cities will secure safe and efficient service; will further the interests of workmen; will protect electrical investments and assist in the education of the people."

The Wildt Leclanche Battery.

The accompanying engraving illustrates a new form of Leclanché battery brought out by Messrs. E. A. Wildt & Co., of this city, and designed to avoid the use of the porous cup. The cell consists, as will be seen, of the usual glass jar, which has cast in it three projecting lugs, one in the centre at the bottom and one on each side near the top. These lugs serve to hold in place a curved partition of glass, which is perforated by conical holes. Within the space thus partitioned off is placed a rod of carbon, which is packed around with broken carbon and bi-oxide of manganese. The top of the partition is sealed so as to prevent evaporation, and to keep the rod in a central position.

By this construction it is claimed the creeping of the salts is prevented, and a short circuiting of the battery does not render the carbon element useless, as it can be readily soaked. The crystals are said to form chiefly on the zinc rod.

The Desmazure Storage Battery.

In a recent note we drew attention to the fact that a new type of storage battery was employed as the source of power for an electric launch tried at Havre, France. These cells are the invention of M. Desmazure. The electrodes consist of amalgamated zinc plates and porous copper plates, the latter being produced by the consolidation of powdered copper under very great hydraulic pressure. The zinc plates form the negative electrode and are in metallic connection with the box, which is also of zinc, while the positive plates are placed in vegetable parchment bags and suspended in the usual way. Contact with the negative plates is prevented by glass rods. The electrolyte is a mixture of chlorate of sodium and a caustic solution of zinc oxide. The patent gives very complete data relating to the construction of a particular form of cell, from which the following are abstracted as the more important: There are five positive and six negative plates, having a total weight of 13 pounds. The positive plates measure 10 inches square, and are .08 of an inch thick. The negative plates, which reach right to the bottom of the cell, measure 10 inches by 12 inches, and the weight of the box complete is 45 pounds. The external dimensions are 12 inches long by 3¼ inches wide and 16 inches high. The cell should be charged with a current of 18 ampères, and may be discharged at 36 ampères, the total capacity being 372 ampère hours. The E.M.F. on open circuit is 1 volt, but when discharging at full current it falls to .85 volt.

A New Voltmeter.

Messrs. Siemens and Halske are now introducing a new engine room voltmeter, for which it is claimed that it cannot get out of calibration, as it contains no springs or permanent magnets. The principal parts are a fixed horizontal circular coil, over which is pivoted on knife-edges a smaller coil, which, in its zero position, is inclined to the horizontal coil at an angle of about 60 degrees. The coils are so coupled that a current traversing them tends to turn the smaller coil through its vertical position until it becomes parallel to the fixed coil. This tendency is resisted by a small balance weight. The movable coil is provided with a light pointer, indicating the potential on a dial of ground glass. By adopting a transparent scale readings can be taken from either side. The whole instrument is about 6 inches wide by 6 inches deep by 9 inches high, and is exceedingly sensitive. The movable coil contains 800 turns of 2.5 mils German silver wire, and has a resistance of 34 ohms. The fixed coil contains 1,150 turns of the same wire, and has a resistance of 664 ohms. As at present made the instrument reads with accuracy from about 60 to 110 volts.

Charging a Metal Plate.

To the Editor of The Electrical World:

SIR: Will you inform me through the columns of THE ELECTRICAL WORLD how I can charge a single electrode, that is, a plate of copper or brass, by a common galvanic battery, so as to give a shock strong enough to stun, or destroy, the life of a small animal, such as a rat or mouse, by their coming in contact with it? W. W. M.

LANCASTER, Pa.

ANSWER.—You can charge a metal plate by providing it with an insulating handle which would prevent escape to earth. But such a charge would be likely to be soon dissipated, especially in a damp atmosphere. It would require a very large number of galvanic cells to charge a plate sufficiently for the purpose you mention. A more convenient apparatus would be an ordinary electrophorus, which would, however, labor under the same disadvantages as the plate in regard to the escape. You might also use a rheostatic machine with a few cells for charging. —EDS. E. W.

Calling Generators for Telephone Exchanges.

BY T. D. LOCKWOOD.

When the telephone entered the commercial field, it was of course at once seen that a call bell was required at each station. The three classes of bells that suggested themselves were: mechanical bells set in motion by electro-magnets vitalized from a distant station; neutral electric bells actuated by the alternate presence or absence of a current in the circuit; and polarized bells depending for their operation upon the change of direction of the current in the main circuit. The latter soon by reason of their convenience and sensitiveness were almost universally adopted.

The present calling appliance so well-known as the "magneto bell," is the form into which the device resolved itself. But it is clear that the above name, while descriptive, is not *fully* descriptive. The so-called "bell" embraces also a source of electricity, means for utilizing the said source, and a switch for making automatically certain changes in the main and local circuits.

When central stations were small and unimportant, the generators employed to develop and transmit the ringing

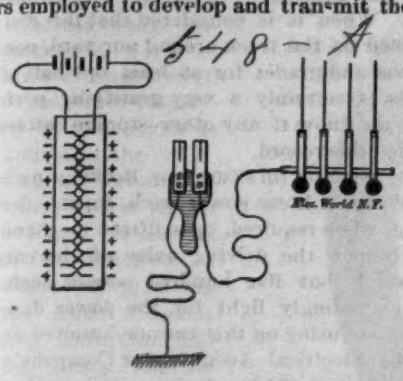


FIG. 1.—CALLING GENERATORS FOR TELEPHONE EXCHANGES.

currents were simply small machines taken out of a subscriber's bell box and attached to a convenient plate at the side of a switch-board. It must be remembered that though the bells proper are called magneto bells, it is not for any special reason, but simply because they are generally operated by currents generated under the influence of magnets. They may properly be called "polarized bells;" and in this article it is not regarded as necessary to further describe them. Being polarized bells, it is clear that they must be operated by currents of alternating direction; and being intended for use on circuits of varying length, they must be operated by currents urged forward by a considerable E. M. F.

A magneto machine of the most ordinary type unprovided with a commutator was at once seen to be able to furnish currents of such characteristics and was adopted. By reason of its convenience, cleanliness and the little attention it requires, the alternating current magneto machine, as a call transmitter for telephone service, has been exclusively used for subscribers and very nearly so for central offices. One of its points of vantage is that it alternates its currents in the very act of generating them; while when a voltaic battery is employed as the original source, the currents evolved thereby have not to be simply interrupted, as by a rapid circuit breaker, but have actually to be reversed by some special reversing device.

When subscribers to the telephone exchange became

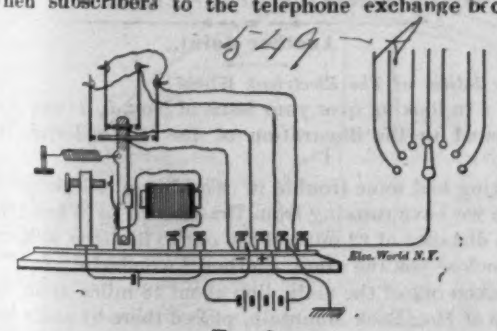


FIG. 2.

numerous, the manual operation of the call generator was found to be a good deal of a tax upon the operator, and at length it was suggested, first, I think, by Mr. C. H. Haskins, of Milwaukee, who promptly put such a device into use, that it would be an improvement to have some arrangement for sending rapidly reversed currents constantly in operation, having one of its terminals permanently grounded and the other connecting by a series of open branches with the several switch-boards, whereby by suitable key devices the current could readily be directed to the corresponding terminal of any one of a series of lines to ring the polarized bell at a distant station connected with the said line.

Mr. Haskins, being a practical electrician of large experience, saw at once that a magneto generator kept running by steady power, and having its armature in a normally open circuit branching to the several switch-board sections, was practically equivalent for this purpose to a battery with an appliance for constantly reversing its poles with respect to the ground and the connections leading to the switch-board.

The latter plan appears to have been the one first actually used by Mr. Haskins.

Quite independently, but some months later, the idea appears to have occurred to Mr. I. H. Farnham, then acting as electrician at the Portland, Me., exchange. This gentleman also contemplated the use of both classes of appliance, but it appeared also to him that as much battery was already in use, and as it was not then easy to find places where power was at all times available, the battery and pole changer plan was the most available.

The various pole changers arranged by Mr. Farnham are so clearly delineated and show so much that no apology is needed for their introduction here, and Figs. 1, 2 and 3 indicate their successive forms. All speak for themselves, except, perhaps, the first, which is not a constantly operating device strictly speaking, but which led directly to such a device. The experiments began in January, 1880. Into a piece of dry wood there were driven a number of two point tacks or staples, connected together by wires leading from the calling battery. Every alternate staple on each side is connected with one pole of the battery, while opposite staples are in each case connected with opposite poles. In connection with this was handle or plug of non-conducting material, to which were attached two metal spring strips, at such a distance from each other that, when drawn by hand over the block and staples, the strips would pass over two rows of staples; the springs being connected by wire or flexible cord, one to a ground connection, and the other to the wire leading to the switch-board, where it could be united by the switches to any desired line.

The forms indicated in Figs. 2 and 3 represent the evolution of the appliance. In Fig. 3, the wheel is supposed to be in rotation.

At a somewhat later period the magneto machine became the most popular appliance of the two, because where power could be obtained it was a great saving both in original outlay and in maintenance over the alternative of a number of cells of battery; and still later the generator became almost universally adopted even where power was only available in the day time; but in the latter case it has been extensively supplemented by a pole changer and battery to be used when the power generator was at rest during the night or at meal times. Those who have not had an opportunity to observe for themselves, may here very properly question the propriety of joining the two forms of appliance; if the polechanger is required at night

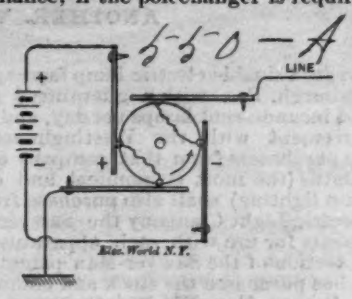


FIG. 3.

and if we, therefore, must have a battery, why not let the polechanger and battery do all the work instead of going to the additional expense of a large generator and, perhaps, also, paying some manufacturer dear for the whistle—or for the power?

The reason why is this: Although we can copy magneto-electric alternations pretty closely by the battery and pole-changer, we cannot copy them exactly. The character of the current and the rhythmical succession of the alternations produced by the battery and pole changer, for some reason or other, which here it is not necessary to closely examine, develop a more pronounced induction upon parallel telephone lines, and thus a good deal of noise is produced upon adjacent lines, annoying the users of the telephones on said lines whenever a call is sent on any one of them. Moreover, to produce an electromotive force having the same power of operating efficiently over great distances, as that of a large magneto machine, the battery cells have to be increased to an inconvenient number. A battery cell at its best is a "dem'd moist unpleasant body," and when he is multiplied his unpleasantness is increased in geometrical progression.

Besides all this, the polechanger has a number of vibrating contacts, which spark and thus oxidize to a greater or less extent, making periodical cleaning and adjustment essential.

On these grounds, even when continuous power is not available, it is best to utilize it to run a magneto generator, and to use it as long as "the wheels go round"—say at all times except meal times and at night. The battery and pole changer can be switched on during these intermissions.

The magneto machine adapted for constant operation is in practice usually placed outside the exchange, at some point or shop in the neighborhood, where machinery is in operation, and the revolving armature is there kept in motion by a belt. One of its terminals is connected with a good ground wire, while the other is extended by a large and strong wire to the central office, where it is branched to each operator. It is worthy of the consideration of exchange managers who use both generator and polechanger, whether in these days of multifarious motors it would not be a good thing to exchange the occasional use of the battery and reversing apparatus for a second magneto generator located at the central office and arranged to be switched on to the operating room when the main generator is at rest. This relief generator might be readily actuated by a secondary battery; or better still a derived current from an electric lighting station; or in default of either of these a water motor. The latter, by the way, has already been frequently used.

Certain defects have been developed in the practical operation of the power generator when used to supply calling currents for a large central office; but the main and only radical fault arises from the well-known disposition of the forces of nature to do no more than they really are compelled to do, and to escape from the control of man at the earliest possible opportunity and by the shortest way.

In plain language, it is to be of course expected that it will frequently happen that two or more operators are sending a call to a subscriber at the same time. What is the natural result? The circuit over which the current has to pass is, considered as a whole, lessened; because the joint resistance of the two or three circuits over which the call is being sent is something less than the lowest. Thus in the diagram, Fig. 4, two lines are shown, and it is assumed that the call is being sent over the two at the same time. The resistances of these are respectively 100

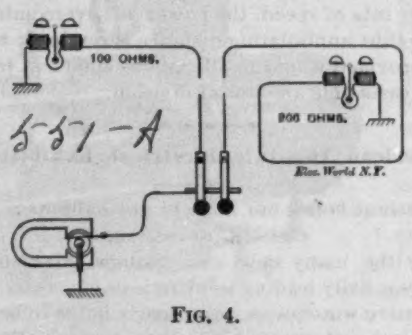


FIG. 4.

and 900 ohms, the latter, perhaps, being a trunk line to a distant town. But the joint resistance of the two is but 90 ohms. As the current in the circuit is inversely proportional to the total resistance of the circuit, it is clear that the available current produced is greater than it is when any one or any two of these lines only is connected. But this fact in the present case is not material.

The more important factor is the following: That whatever the available current at any moment happens to be it has to be divided up between the number of lines which at that moment happen to be connected, and the amount of calling current distributed to each is in inverse proportion to their several resistances, or, in other words, in direct proportion to their several conductivities.

In the case before us, we observe that we have two circuits, each receiving their share of the current. One has a resistance of 100 and the other of 900 ohms. Suppose the current be divided into 10 parts, 9 parts will take the route by the first line, while but 1 part will traverse the other line. That is, the current in one will only be $\frac{1}{9}$th the strength of that in the other.

The practical effect is that when a number of operators have to use the call generator at the same time, the current is apt to run chiefly over the shorter lines, leaving the long ones out in the cold, and their bells will not ring. A very simple remedy has in some cases been adopted for this trouble, namely, to provide a number of small generators, all operated by the same power, each being run

FIG. 5.

by a separate main wire to one or more switch-board sections. By the adoption of this method, none of the generators are overcrowded with work, and they may readily be arranged so that each shall have a number of lines to serve, which have a pretty fair average uniform resistance.

The obvious difficulty with this arrangement is the multiplication of main generator wires. If the power is in the same building with the central station, this does not matter much, but if not, it is a decided objection. It has several times been proposed to couple these small generators in multiple arc, so that the developed current, while having an E. M. F. equal to a single generator, would have an additional volume owing to the greatly diminished internal resistance of the combined machines.

A little thought will convince the telephone electrician that this cannot be successfully done. The machines each generate an alternating current, and the man who would undertake to get them to run harmoniously together, and at all times to reinforce one another, would have a right to an apotheosis, as a living exemplification of patience and skill, and would be a fitting rival for the Montreal hero of 1858, who fought all night with the clock for a circuit.

A certain amount of equalization may be attained in

the use of a single generator by including suitable resistances in the main branch leading to switch-board sections having only short lines to ring over.

It has also been attempted more than once to overcome the drain of current, when a number of lines use the generator at once, by increasing the speed of the generator. This will not do, for two reasons. Its only effect is to increase the E. M. F., which is already high enough. It is taking the bull by the tail instead of the horns; and, in the second place, when the speed of the generator exceeds a certain and well-defined rate, the bell armatures at the sub-stations cannot follow the rapid alternations, and imperfect ringing is again the result.

I think a perfect obviation of the evil of unequal distribution would be to build a generator adapted to be run by power as at present, but having the field magnets and frame sufficiently large to allow of the same number of convolutions upon the armature, whereby, speed for speed, the E. M. F. is kept up to the standard, while the size of wire used on the armature winding is also considerably increased, so that the internal resistance of the machine is kept at a minimum. Then, add a suitable resistance in the main branches leading to the short lines, but leave the longer line switch-board branch clear of resistance. By this arrangement, and by maintaining the proper rate of speed, the power of overcoming resistance and thus annihilating distance is retained, while the current provided would in all cases be sufficient in volume for any reasonable amount of division.

American Institute Electrical Exhibition.

We continue below our notes of the exhibits:

CHAS. S. CROSSMAN.

Among the many new and strange experiences that electricity is daily leading us up to is its effects on watches. Fine sensitive watches are particularly liable to be affected by electrical and atmospheric disturbances. During the months of June, July and August, when these phenomena are most frequent, there are more mainsprings broken than during all the remaining months of the year. Some time about the beginning of last summer when there had been a succession of fine displays of the aurora borealis, it was estimated from actual inquiries that in a single night in the city of New York the mainsprings of not less than 3,000 watches broke. Watches frequently get magnetized in iron mines or in machine shops, where they are incautiously brought near swiftly-running belts. It is a curious fact that no watch will keep the same time with two people. The cause has not yet been definitely ascertained, but it would seem that in some mysterious way a watch is affected by the electric condition or temperature of the wearer. The result of remaining long in the neighborhood of dynamos is now well known, and the watches of some of the visitors at the Exhibition have played strange freaks and developed eccentricities never before indulged in. Mr. Crossman has an exhibit of anti-magnetic watches, embodying the Giles anti-magnetic shield, which can be put in any watch, and prevents any possible magnetization from any source whatever.

The advantages claimed for these watches are: Protection against personal, earth, or atmospheric magnetism; and against dynamos, electric wires and the numerous electric and magnetic influences by which we are now constantly surrounded.

THE TROPICAL AMERICAN TELEPHONE COMPANY.

This exhibit possesses considerable attraction. This company purchased the patent rights of Bell and Blake in telephone inventions for Central and South America and the West Indies, and it has the sole right to sell for export, to use and to license the instrument in those countries.

The switch-boards of this company deserve attention. They include the popular "peg" board, the "Williams," the multiple switch-board for large exchanges of over 500 subscribers, and the "pony-switch" board for small exchanges, private establishments, public buildings, etc., where there is a limited number of lines. These are supplemented by central office calling apparatus consisting of automatic pole changer, switch-board generator and hand generators, Western Electric, Gilliland and Williams. The exhibit, in charge of Mr. Bates, is extremely interesting and well worthy of careful inspection.

The Lykens Valley Mine Electric Railway.

So great has been the success attending the Schlesinger road put in the Lykens Valley coal mine by the Union Electric Company, of Philadelphia, that an order has now been given for a second installation. Mr. Schlesinger has in fact clearly demonstrated that the electric motor is cheaper for such work than the steam locomotive, and he has thus been the first in America, if not in the world, to replace a steam locomotive by an electric motor.

A few details about the new work may be interesting. Mr. Schlesenger in a communication says: "The gangway (No. 3 level) was formerly operated by 24 mules, and these were only recently replaced by a new mine locomotive, which now, in turn, has to give way to something superior, *i. e.*, the electric locomotive. The length of the road in the gangway is at present somewhat over a mile, with a grade of 6 inches in the 100 feet. Three hundred loaded cars will be hauled per day, the number per trip being from 18 to 20. The conductor will be arranged in a manner similar to that of the road in the upper gangway, and will have switches and turnouts. The power will be supplied to the road from the station now running the first road, the wires having to pass down a steamway (or shaft) 1,800 feet long, having an inclination of 70 degrees. Measured vertically, the second road is 900 feet below the first, and about 15 feet below water level. Work on the road as well as on the machines has already begun."

The Recent Electric Light Combination.

The following important announcement has recently been issued to the stockholders of the Consolidated Electric Light Company and the patrons of the Sawyer-Man Company, by Mr. Hugh R. Garden, vice-president and counsel:

The Consolidated Electric Light Company, owner of the Sawyer-Man patents, has, from time to time, received numerous applications for licenses to manufacture and sell the incandescent lamps and other electrical apparatus covered by its patents, which applications it has been constrained to decline.

With the view, however, of utilizing the inventions of others who have achieved success in the electric lighting field, and at the same time of concentrating and enlarging its business to meet the constantly increasing demand for its apparatus, the Consolidated Electric Light Company has recently completed the following important transactions, which are of interest to its stockholders and patrons.

First—It has granted to the Thomson-Houston Electric Company a license to manufacture and use incandescent electric lamps and attachments, in plants and stations established by that company in combination with its extensive and popular arc lighting system upon an agreed royalty, and has also entered into a contract with that company, whereby the interests of both companies in the manufacture and sale of electrical apparatus other than that covered by the Sawyer-Man patents, are mutually promoted.

Second—It has purchased from the Westinghouse Electric Company its valuable electric lamp factory and equipment at Pittsburgh, Pa., with a guaranteed capacity of five thousand incandescent lamps per day, and has entered into an agreement with the Westinghouse Company whereby the purchasers from that company of its alternating apparatus (the most economical and efficient for central station lighting) shall also purchase from the Consolidated Electric Light Company the Sawyer-Man lamps and attachments for use with such apparatus, and shall have the protection of the Sawyer-Man patents.

Third—It has purchased the stock and assumed the control of the Sawyer-Man Electric Company, which has heretofore been its sole exclusive licensee, and will conduct its commercial department through the agency of the Sawyer-Man Electric Company.

Fourth—It has purchased that valuable and extensive manufacturing and business property, Nos. 510 to 534 West Twenty-third street, in the city of New York, having a front of 325 feet on said street, with floor space of 117,000 square feet ready for use, and with a capacity for an increase to 200,000 square feet, being sufficient for the establishment, at that point, of its general offices and of its principal legal, technical, manufacturing and commercial departments.

To meet the increasing business demands of the Westinghouse Company, the Thomson-Houston Company, the Sawyer-Man Company and the general public, the Consolidated Electric Light Company will, within a short time, manufacture at its combined factories at least ten thousand electric lamps, with the necessary electrical attachments, per day; and this demand, based upon the reputation for excellence which these companies have attained in their respective fields of usefulness will greatly enhance the value of its property, and will promote the interests of incandescent electric lighting to an extent hitherto unknown.

This recognition of the Sawyer-Man patents and consequent concentration of power in the Consolidated Electric Light Company is attended with a corresponding ability, on the part of this company, to protect itself from infringement of its patents, and steps have recently been taken, in the institution of new suits against infringers and in the vigorous prosecution of those heretofore instituted, which, it is believed, will speedily and effectually secure to the company the additional profits from that source to which it is justly entitled.

The Electric Light Not a Fire-Bug.

The following from the St. Louis *Globe-Democrat* is worthy of note as impartial testimony and opinion: The facts, so far as they are obtainable, tend to show that the electric light is not so much of a fire-bug as it is popularly supposed to be. The fire marshal of Boston, Mass., for example, reports as the results of his investigations into the causes of fire, that where there were three fires from electric lamps, there were thirty-nine from kerosene lamps, nine from gas, six from candles and seventy-five from friction matches. Of course there are a great many more kerosene lamps than there are electric lights, still the proportion of only three fires from electric lights to 129 from the other causes, is something to arrest attention. The electric light men contend that with proper care in construction and maintenance the fires might have been avoided. This is true, but their antagonists might retort with equal truth that had sufficient care been exercised the fires from matches, kerosene lamps, gas and candles might have been prevented. Cheapness of manufacture and carelessness do not pertain exclusively to either kerosene lamps or to electric lights. Fewer persons handle the one than the other, consequently there was less loss from the electric lights than from kerosene. The truth appears to be that electric lights as commonly constructed and used are safer than any other system of lighting as ordinarily managed, but that with perfect construction and management it is a mode of lighting exceptionally safe.

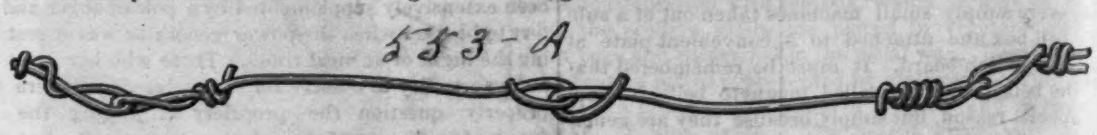
The New Reckenzaun Car in Philadelphia.

We are indebted to Mr. W. Wharton, Jr., for the following, in reply to our inquiries on the subject:

"I would remark that the new eight-wheel storage battery car recently completed by us ran a few days ago forty-five miles with one charging of the batteries, twelve miles of which distance was run in one hour, without the least heating of the machinery or any trouble whatever. When it is considered that this distance was accomplished on the track around our yard, consisting of sharp curves and grades for at least one-half of the distance, this is certainly a very gratifying performance. Please let me know if any other storage battery car has ever equaled this record.

"We are using on this car two Reckenzaun motors of eight mechanical horse-power each, capable, however, of developing, when required, up to fifteen mechanical horse-power each upon the driving axles of the cars. These motors weigh but five hundred pounds each, and are therefore exceedingly light for the power developed by them. We are using on this car one hundred and sixteen cells of the Electrical Accumulator Company's make of the 23-C pattern, weighing forty pounds each, filled and ready for use. Although our four-wheel car has given great satisfaction, and has proved itself reliable at all times, the new eight-wheel car equipped with the Reckenzaun motors is a great advance upon it."

We would add that we know of no instance in which this record has been anything like equaled.



ANOTHER WONDERFUL WIRE JOINT.

Power Required for Incandescent Lamps.

To the Editor of The Electrical World:

SIR: Will you please give me the power required to drive a dynamo to produce 100 candle-power, or say 200 c. p., divided up among 8 and 16 c. p. incandescent lamps. Also what such a dynamo would cost and if ¼ h. p. engine would run the dynamo fast enough to produce the light. D. C. S.

ANSWER.—Most electric light companies guarantee ten 16 c. p. incandescent lamps per horse-power, or, in other words, 160 candles per h. p. To produce 100 candle-power would therefore require ⅝ h. p., and for 200 c. p. 1¼ h. p. would be required. You can obtain the cost by applying to the electric lighting companies.—EDS. E. W.

Another Joint.

To the Editor of The Electrical World:

SIR: In looking over your issue of Nov. 5, I was quite interested in the illustration of the "Wonderful Wire Joint."

Having had some trouble in working a telephone line which we have running from Brattleboro to Wilmington, Vt., a distance of 22 miles, I set out to find the difficulty, and inclose you the same, another "wonderful joint." It was taken out of the main line about 18 miles from here on top of Hog Back Mountain, placed there by some inexperienced "electrician" not employed by the telephone company. C.

BRATTLEBORO, Vt.

The accompanying illustration shows the alleged joint so well that no further description is deemed necessary. It is very hard to believe that such a joint was ever made in practical work.—EDS. E. W.

Analogies Between Electrical and Mechanical Engineering.

To the Editor of The Electrical World:

SIR: In your editorial comments upon the article "Practical Analogies between Mechanical and Electrical Engineering," appearing in THE ELECTRICAL WORLD of Nov. 5, you intimate that "not all of the analogies pointed out are to be taken as strictly true." I acknowledge that in some instances the facts have been somewhat distorted for the sole purpose of rendering the similarities more manifest. If, however, they have assisted the mechanical engineers to a better understanding of electrical phenomena, or have prompted a further study of nature in the language of experiment, the purpose of the writer will have been accomplished. H. F. WATTS.

SOMERVILLE, Mass., Nov. 14, 1887.

The Russell Automatic Engine for Electric Lighting.

The demands of electric lighting have called forth the highest skill of the steam-engineer, and the result has been a marked improvement in the regulating properties of engines and consequently in their efficiency. Among the engines of this class which have found considerable application in electric light stations are the automatic engines built by Messrs. Russell & Co., of Massillon, Ohio.

In the sizes of the Russell engine below 11 inch bore of cylinder, the semi-girder type of bed is employed, as shown in Fig. 1, which is designed to give stiffness, and the cylinder is overhung so as to be free to expand while working.

The cylinder and steam chest of the engine are jacketed so as to prevent condensation. The girders are bored, and the cross-head has the pin in the centre of its length and large brass shoes which are made adjustable. The connecting rod, as will be seen, has solid ends and wedge adjustments, and is made of forged steel.

The valve employed in this engine is known as the "Gidding equilibrium slide valve," and is shown in Fig. 2. It consists of but one piece, a single casting, having the Allen "double port" feature and taking steam from underneath. The tendency to leave the seat is overcome by two needle hole ports, the smaller of which admits steam to the back of the valve, while the large one prevents the accumulation of a surplus pressure by permitting the escape of a certain portion of the steam into one of the exhaust cavities of the valve. The resultant pressure behind the valve due to these two openings is just sufficient to hold the valve up to its seat and insure a tight joint. The pressure back of the valve is usually 50 per cent. of the boiler pressure, while the difference of pressure under and behind the valve is from 2½ to 3 pounds. The valve adjusts itself to wear, water and position, and requires by actual dynamometer test while running but a small per cent. of the power the engine is developing to move it.

Another feature of this engine is the governor, which moves a single eccentric across the shaft, varying the travel of the valve to suit varying loads and boiler pressure, as shown in Fig. 3. The lead is preserved practically constant for all points of cut-off, and the governor possesses a high degree of stability, being mechanically locked in every position it assumes; it is impossible to move the weights by pushing on the eccentric when the springs are out; consequently no dash pot or other device is necessary to prevent the sudden fluctuations due to pendulum action. At the same time the governor is very sensitive, instantly adjusting itself to great variations in loads without perceptible change. Many of these engines are said to be working on one and two per cent. variation between extreme loads.

The large sizes of these engines, with 11 inch bore of cylinder and above that, are built with either single or double valve, and have the "Porter" type of bed.

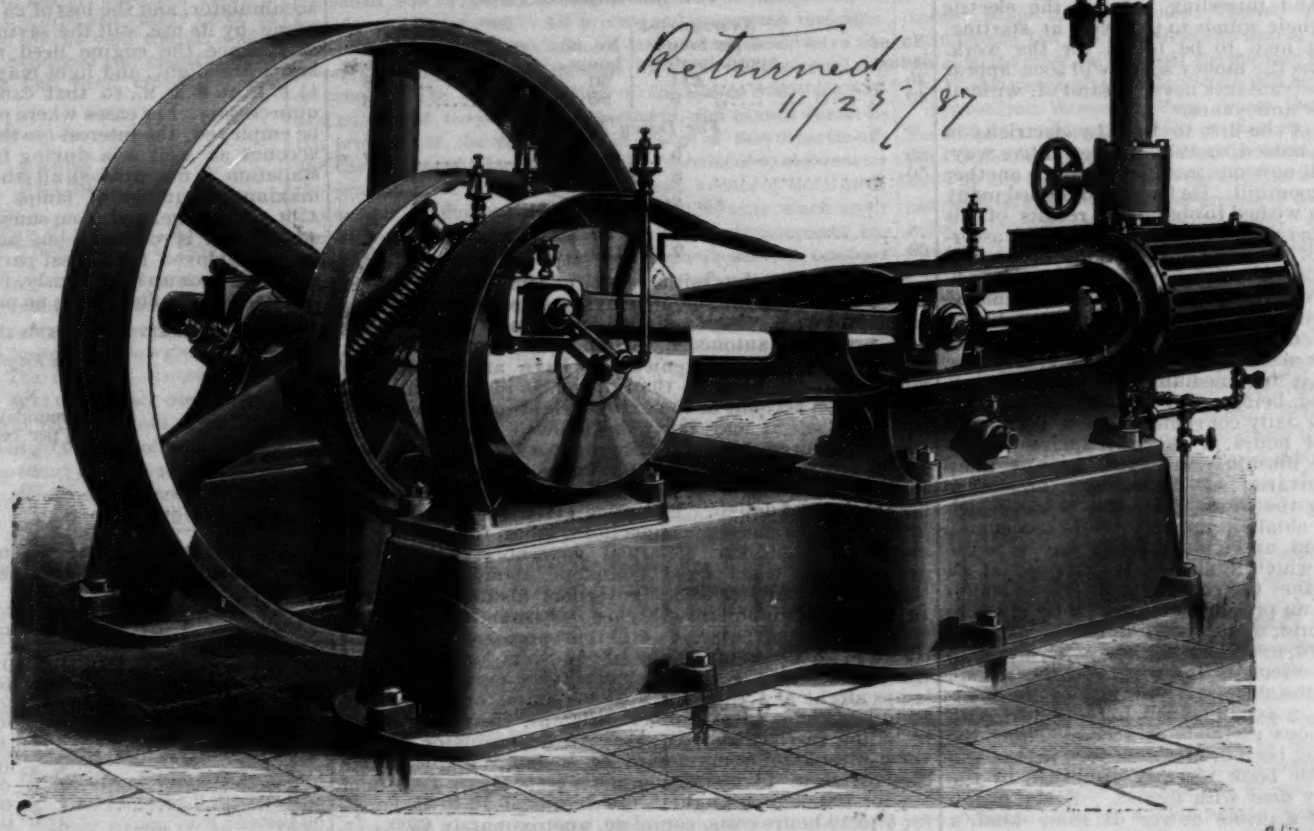


FIG. 1.—THE RUSSELL AUTOMATIC ENGINE.

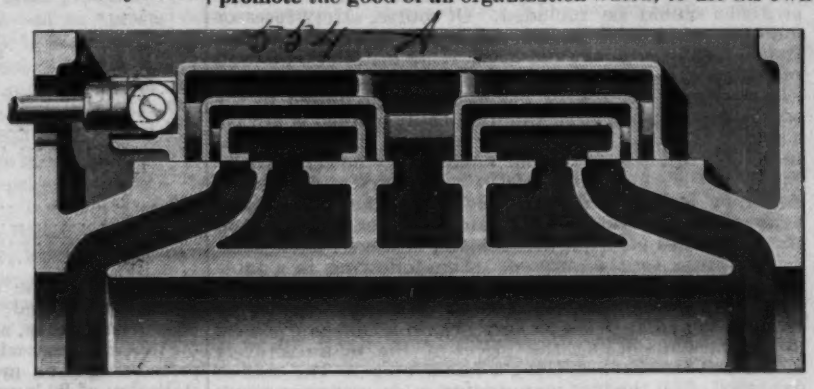


FIG. 2.—VALVE.

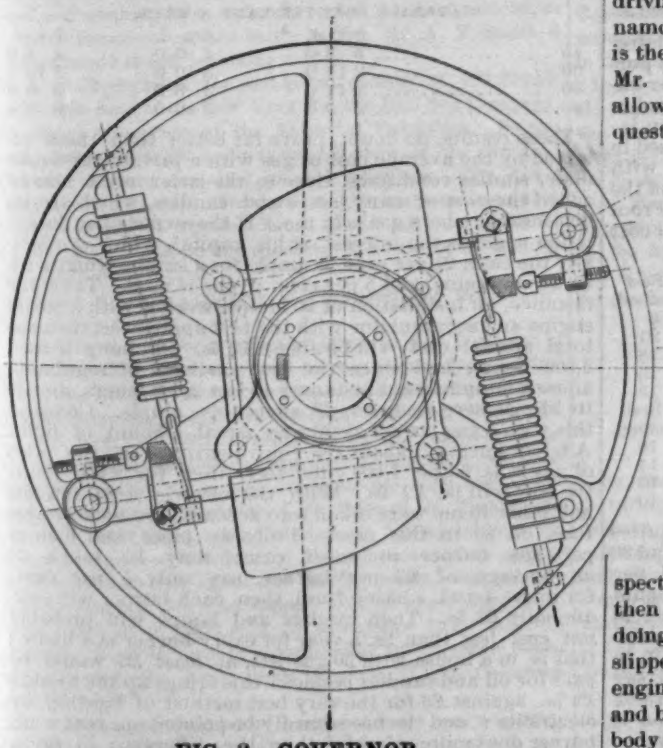


FIG. 3.—GOVERNOR.

The Death of Sidney F. Shelbourne.

It is with the utmost pain and regret that we record the death of Mr. Sidney F. Shelbourne, of this city, at the American Institute Electrical Exhibition on the 9th inst. Mr. Shelbourne was a member of the council of the American Institute of Electrical Engineers, which was to hold a joint meeting with the New York Electrical Society at the exhibition on the evening in question and he had gone an hour or so before the time of meeting in order to examine the electrical exhibits. He took great delight in machinery, and arriving at the space occupied by the Tucker Electrical Manufacturing Company he became interested in the operation of the Trenton engine there, driving the Mather incandescent dynamos. Close to the Trenton engine is the Ball, within the same space. Mr. Robert Ashton, the engineer, allowed Mr. Shelbourne, on his request, to enter the space, and to inspect the engines and dynamos closely. Mr. Shelbourne then tried to pass between the two engines, but in so doing, his lame right foot, carrying an iron support, slipped, and he fell against the fly wheel of the Trenton engine. In an instant he was whirled through the air, and before any one could interfere or stop the engine, his body lay crushed and lifeless on the floor.

Although about 200 members of the two societies had gathered to listen to the paper by Mr. C. Cuttriss on recent improvements in apparatus for ocean telegraphy, it was naturally felt that the meeting must be adjourned. This was accordingly done, a committee being appointed to prepare resolutions appropriate to the sad occasion. Mr. Shelbourne's body was removed during the evening and handed over to the care of his relatives. On Friday it was taken to Albany, and is now buried in the family plot there. He was fifty-one years old. The deceased gentleman was well-known in connection with electrical matters. He was a graduate of Union College, Schenectady, and of Yale, and had had considerable practice both as civil engineer and as lawyer. He was president of the Electric Lines Company of this city, and succeeded some years ago in obtaining from the Board of Aldermen one of the earliest underground franchises granted in this country. Since the formation of the Subway Board, which he regarded as unconstitutional, he had carried on a steady and unflinching fight against that body in the courts and the newspapers, and at the hour of his death was awaiting a decision on appeal in the matter. Mr. Shelbourne was also interested in the question of insulation for wires, on which he had some patents, and quite recently had given much of his time to the study of electric railways, going so far, in fact, as to devise a new system of supplying current to the cars.

As stated above, Mr. Shelbourne was a member of the Council of the American Institute of Electrical Engineers, in whose welfare and success he took the warmest interest, serving willingly on special committees, and placing his time and legal ability freely at its disposal. A notable part of his work for the Institue was the revision of its rules and regulations in 1885, a task which he performed with great care and success. His desire for the prosperity of the Institute, and his readiness to undertake special responsibility were often a stimulus to his associates, who realized that, no matter how tenaciously he might hold to his personal views, his thought in all things was to promote the good of an organization which, to use his own language, "ought in time to have a reputation equal to that of the Royal Society itself."

It may be said that Mr. Shelbourne is another victim of thirst for knowledge. Though a man habitually reserved, he never hesitated to ask questions of anybody in order to increase his stock of information, and was always anxious to inspect any new piece of apparatus for himself. It was this disposition that took him within the rail of the exhibit where he met with his death, and which has deprived legal and electrical circles of one whom to know was to esteem.

Appropriate resolutions of regret were adopted at the adjourned meeting of the two societies, held on Nov. 15, at the house of the Civil Engineers, 127 East Twenty-third street.

The Chinese Concession.—A dispatch from Philadelphia of Nov. 12 says: From present indications it looks as though the syndicate in this city which secured concession from the Chinese Government through Wharton Barker would soon be operating in China under the authority granted. For several weeks past Ma Kie Chang, the Chinese Commissioner, has been negotiating with Mr. Barker and arranging details. These negotiations have been brought to a conclusion, and Ma Kie Chang sailed for China to-day in one of the Cunard steamers by way of Liverpool and the Suez Canal. Mr. Barker went to New York this morning to see him off. Mr. Barker will return to this city and at once complete all important details, after which he will also start for China to arrange all essential matters and to get the bank and the other enterprises in working order.

The Cost of Domestic Electric Lighting.*

BY SIR DAVID SALOMONS.

Private electric lighting installations are on the increase, but only slowly. There are even at present many owners of country houses who erect private gas works in ignorance of the great advantages to be derived from the electric light. In fact this new light is still regarded with suspicion by those who have not a full knowledge of the subject. This, however, is but natural; it is well known that there is scarcely an installation existing where breakdowns do not occasionally occur, and besides, experience has shown that tenders for erecting the work vary so much that the intending installer is puzzled, and either leaves the matter alone, or, worse for him, selects the lowest tender. An electric light installation must be done thoroughly well if it is to be satisfactory, otherwise it is best left alone, saving expense and vexation after the work is supposed to have been completed. Like many other things, whatever the first cost may be, the best is the cheapest in the end, and intending users of the electric light must make up their minds to pay well at starting, and employ the best men to be found for the work. Under these conditions the money spent will soon appear profitable, and bring advantages never dreamt of, without a shadow of trouble or annoyance.

The writer was one of the first to light by electricity in England, so far back, indeed, as 1874, in a primitive way; and from that time till now one installation after another has been erected at Broomhill. He has also designed many others for friends who wished to obtain the results of his experience, and has therefore had ample means of ascertaining the expense of erecting installations of various kinds as well as the cost of maintenance. His present object is simply to give a general idea of the expense of erecting a good electric light installation as thoroughly as knowledge, time and money can do it, and the figures given may be taken as absolutely within the mark for the very best, but beyond it for medium work. The best is strongly recommended, being most satisfactory not only for endurance, but for daily convenience, as it permits of a regular light for 24 hours of the day under all circumstances, and the illumination given by any lamp will practically be invariable. There are three ways in general of erecting the work. The first is one which enables the owner to obtain light only while the engine is running. The second, and a much better way, is to use an accumulator from which light may be obtained at all hours of the day, whether the engine is running or standing. In this case certain precautions have to be taken to avoid injury to the lamps, and the man in charge must act accordingly. The third, and by far the best way, although the most expensive to erect, is to work on the second method, and have all the necessary precautions automatically performed. It is not intended here to deal with technicalities, the various methods of accomplishing the results spoken of having been briefly described in the second edition of a little book recently published by the writer. Here we only deal with figures. Every installation must consist of a prime mover of some kind, a dynamo, a circuit of wire to lead the current to the lamps and certain measuring apparatus and instruments for turning on and off the current termed switches. A governor to secure regularity in the light is often added. If a storage system is used, then an accumulator must also be erected, and some further apparatus; if perfection is desired, two electrical governors and some automatic switches should be included. Of course, safety fuses or cut-outs must always be employed to secure perfect freedom from accident and fire. If an installation is well put up, the general fire risks are practically reduced to *nil*, no lamps, candles, or gas light being required in the establishment; but an installation badly erected is always a source of danger. Direct currents are the best to use in private installations. The engine may be actuated by gas (as in the well-known "Otto"), ordinary high-pressure steam, or low-pressure steam, as in the Davey motor, or again may be worked by hot air or water. Engines on the last-named principle are seldom, however, made sufficiently large for the purpose. The following is a table showing the cost of installation of various sizes, Otto gas engines being employed as well as steam engines by Messrs. Marshall. Other makers' prices for the same powers do not vary much, and the prices of the manufacturers mentioned are taken as being a fair average. The cost of dynamos of all the best manufacturers do not vary much for equal capacities, and the only accumulators largely used at the present time are those of the Electrical Power Storage Company, and Messrs. Elwell-Parker. The goods of both these firms are practically indentical in output and price. Other cells exist, but they have not borne the brunt of time, and, therefore, they must be regarded as being still in the experimental stage, although some may eventually prove better than those above mentioned. In giving prices, a sum has always been added to the bare cost of the article in order to amply cover the cost of carriage anywhere by rail in Great Britain; and also of foundations, any necessary apparatus, such as gas meters, taps, pipes, belting and main switches, and the cost of fitting up generally. The lamps are assumed to be 16 c. p. incandescent, or of 8 c. p., when double the number is allowed.

INSTALLATIONS WITHOUT AN ACCUMULATOR.

Gas Engines.

No. of lamps.	Cost of dynamo, fixing, etc.	n. h. p.	i. h. p.	Cost of engine, fixing, etc.	Wires and lamps.	Total.
	£			£	£	£
25	50	2	4	170	50	270
40	60	3¼	6	210	80	350
50	70	4	8	220	100	390
90	105	7	14	260	180	545

No doubt the engines would run more lamps, but the work then imposed would be advancing nearer the limit of capacity of the machines than is desirable. This remark applies also to the following tables:

Davey Motors.

No. of lamps.	Cost of dynamo, fixing, etc.	Actual h. p.	Cost of engine.	Wires and lamps.	Total.
	£		£	£	£
25	50	3	120†	50	220
50	70	6	220‡	100	390
80	100	10	300‡	160	560

* Industries.
† This engine requires continual attention.
‡ These engines have hopper boilers, and need attention every eight hours.

Steam Engines.

No. of lamps.	Cost of dynamo, fixing, etc.	n. h. p.	Cost of engine, boiler, fixing, etc.	Wires, lamps, etc.	Total.
	£		£	£	£
45	65	3	220	90	375
60	75	4	250	120	445
90	105	6	310	180	595
120	125	8	350	240	715

In all cases of the last table there is a large margin of power given to allow for variations in the pressure of the steam in the boiler. It is considered that £2 per lamp will fairly cover wiring a house in a first class manner (provided the engine shed is near the dwelling to be lighted), including lamps, lamp holders, switches and fuses, and also fittings of a simple kind. More elaborate fittings must be regarded as luxuries, and need not here be considered, since no limit to price can be fixed in this direction. Thus we see the average cost per lamp, in the installations given, works out as follows:

For Gas Engines.

No. of lamps.	Average cost per lamp, approximately.	No. of lamps.	Average cost per lamp, approximately.
25	£11	50	£8
40	9	90	6

For Davey Motors.

25	9	80	7
50	8		

For Steam Engines.

45	8	90	6,10
60	7.10	120	6

So much for the initial cost of simple installations. When an accumulator is employed extra expense is involved by the cost of cells, shelves, some extra switches, and probably automatic switches and governor. In practice it is not convenient to have an accumulator which will supply more than about 80 16 c. p. lamps at one time on account of the extra weight of the cells and the expense. It may fairly be allowed that the switch boards required when an accumulator is used will cost about £40 for any number of lamps up to 50, and £60 for 50 to 150 lamps with measuring instruments, all of the best make and design. The price given for the accumulator includes shelves, connections, labor for putting up and carriage. Some electrical governors (not on the engine) cost when fixed complete about £15, and a thoroughly complete set of governors about £70 to £100. In addition, automatic switches cost some £30. Lamps work with currents at different pressures, the most common in use being those of 60 volts and 100 volts. An accumulator giving 60 volts for a maximum of 30 lamps alight at a time for 8 to 10 hours, or proportionately longer for a less number of lamps, costs about £110, including carriage and shelves. An accumulator for 100 volts suitable for a maximum of 50 lamps alight at one time for 8 to 10 hours, complete, costs about £200; and one for 100 volts to light a maximum of 70 to 75 lamps for 8 to 10 hours costs, complete, approximately £300.

TABLE OF COST

With Gas Engine and Accumulator.

No. of Lamps.	Cost without accumulator.	Accumulator and switch-board, and one governor.	Best method. Accumulator, switch-board and governors and automatic switches.
	£	£	£
25	270	415	515
40	350	605	705
50	390	665	765
90	545	920	1,050
With Steam Engine.			
45	375	630	730
60	445	720	850
90	595	970	1,100
120	715	1,090	1,220

In all cases the cost of the engine and accumulator house is neglected, since a building suitable for this purpose often exists, and where it does not, 4d. to 6d. per cubic foot capacity will amply cover the expense, the higher price being for a more substantial building. Thus an installation of 90 lamps with accumulator could be housed in a room 60 feet by 20 feet, and 12 feet average height, with a division to separate the cells from the machinery, and the cost of this at 6d. per cubic foot would be £360. From the above tables an approximate average of the initial cost per lamp with accumulator is given in the following:

No. of lamps.	With gas engine and accumulator.	Best method.
	£	£
25	17	21
40	14	18
50	13	15
90	10	12
	With Steam engine.	Best method.
45	13	16
60	12	14
90	11	12
120	9	10

Now for working expenses. A gas engine requires about 20 cubic feet of gas per hour per i. h. p., and 30 cubic feet per b. h. p. Gas is here taken at 3s. 6d. per 1,000 cubic feet. For oil and waste 2d. an hour should be allowed. Lamps at present cost 5s. each, whether 16 or 8 c. p., and are expected to last 1,000 hours. The number of hours after sunset to 11 P. M. and from 6 A. M. to sunrise for the whole year amount to some 2,075, say roughly 2,000 hours. The calculations are made on these data, which practically indicate that the installation is worked all the year round very nearly to its maximum. The sinking fund and interest are taken at 7½ per cent. in simple installations, and 10 per cent. where an accumulator is employed. Attendance is taken at 10s. a week in all cases, since the man will not be required to devote more than one-half or a third even of his working hours to the installation. Thus we get without accumulator:

Gas Engines.

No. of lamps.	Gas at 3s. 6d.	Attendance, waste, oil, etc.	Lamps.	Total.
	£	£	£ s.	£ s.
25	28	42	12 10	82 10
40	42	42	20 0	104 0
50	56	42	25 0	123 0
90	98	42	45 0	185 0

Steam Engines.

No. of lamps.	Coal.			
45	50	42	22 10	114 10
60	65	42	30 0	137 0
90	100	42	45 0	187 0
120	130	42	60 0	232 0

Coal is taken at £1 per ton delivered, and 6 lbs. per hour per i. h. p., with a margin for lighting up.

It is evident at once on comparing these tables that the difference in cost for installing as well as the working expenses for gas and steam engines is much the same up to, say 100 lamps; and since gas engines require less attention, these are to be preferred for small installations; their only drawback is the liability to stoppage. For a larger number of lamps the steam engine has every advantage. No interest or sinking fund has been allowed for in the above, for had a private gas works been required then the interest and sinking fund on this would counterbalance the other. Had an accumulator been used the expenses would amount to about the same, for although an extra sum must be allowed for the wear and tear of the accumulator, and the loss of 25 to 30 per cent. which must ensue by its use, still the saving is very great in another way, since the engine need not be run when very few lamps are alight, and light may always be obtained from 11 P. M. to 6 A. M., so that candles and lamps are quite unnecessary. For cases where private gas works would not be employed, the interest on the work must be taken into account as well as a sinking fund. Naturally if the installation is not worked all the year round, and if the maximum number of lamps is not in use daily from 6 A. M. till sunrise, and from sunset till 11 P. M., much of the annual cost is reduced; but again, if most of the lamps are unemployed for a great part of the year the expense per lamp goes up enormously, for we should be paying interest on the capital doing no productive work.

TABLE OF SINKING FUND AND INTEREST, APPROXIMATELY.

Gas Engines.

No. of lamps.	No accumulator. 7½ per cent.	With accumulator. 10 per cent.	With accumulator, best method. 10 per cent.
	£	£	£
25	20	41	51
40	26	60	70
50	30	66	78
90	40	92	105

Now for total annual expenditure, including sinking fund and interest for gas engine installation:

No. of lamps.	No accumulator.	With accumulator.	With accumulator, best method.
	£ s.	£ s.	£ s.
25	102 10	123 10	133 10
40	130 0	164 0	174 0
50	153 0	189 0	199 0
90	225 0	277 0	290 0

AVERAGE COST PER LAMP A YEAR.

	£ s. d.	£ s. d.	£ s. d.
25	4 0 0	5 0 0	5 7 0
40	3 2 0	4 2 0	4 7 0
50	3 0 0	3 16 0	4 0 0
90	2 10 0	3 1 0	3 4 0

TABLE OF SINKING FUND AND INTEREST, APPROXIMATELY.

Steam Engines.

No. of lamps.	No accumulator. 7½ per cent.	With accumulator. 10 per cent.	With accumulator, best method. 10 per cent.
	£	£	£
45	27	63	73
60	33	72	85
90	45	97	110
120	53	109	122

TOTAL COST PER ANNUM, INCLUDING SINKING FUND, INTEREST AND WORKING EXPENSES.

	£ s.	£ s.	£ s.
45	141 10	177 10	187 10
60	170 0	209 0	222 0
90	232 0	284 0	297 0
120	285 0	341 0	354 0

AVERAGE COST PER LAMP A YEAR.

	£ s. d.	£ s. d.	£ s. d.
45	3 2 0	4 0 0	4 4 0
60	2 17 0	3 10 0	3 13 0
90	2 11 0	3 3 0	3 6 0
120	2 9 0	2 16 0	3 0 0

These results, no doubt, prove far better than those attained by the average cost of gas with a private gas-works under similar conditions, since to the latter must also be added the cost of many lamps and candles, which are indispensable where gas is in use. If the owner of an installation neglects the interest on his capital, which is generally the case, 2½ per cent. is ample for a sinking fund with no accumulator, and 5 per cent. if one is used. Take, for instance, an installation of 90 lamps, worked with a steam engine and accumulator with the best appliances; then the total annual cost will be about £3 6s. per lamp if used 2,000 hours, and since the best methods of regulation allow a lamp in most instances to last 2,000 hours, double its life, as here assumed, £3 should be ample. Compare this with a gas burner giving an equal amount of light. A 6-foot burner is about the equivalent, and if the price of gas is 3s. 6d per 1,000 cubic feet, then for 2,000 hours the cost will be £3 2s. With the electric light, interest and other items were taken into account; we must, therefore, do so in this case. Probably pipes and fittings per gas burner in most cases may be taken at an average of £3 per burner, say only 5 per cent. for interest and sinking fund, then each burner will cost annually £2 5s. Then candles and lamps will probably not cost less than 2s. a year for every burner in a house: that is, in a house with 50 gas jets, at least £5 would be paid for oil and candles besides; this brings up the total to £2 7s., against £3 for the very best method of lighting by electricity; and it need hardly be pointed out that a gas burner does more mischief than the difference in price, without the convenience. For a large installation of 150 lamps and over, the cost rapidly becomes less than in the case of gas. The reason why 25 to 120 light installations have been chosen for examples is because in the majority of houses 25 lights is the number mostly in use, and in a large country house it is rare that more than 120 are required at one time. The maximum lighting power of the installation does not prevent more lamps being set up, but the number in use at one time must not exceed the maximum capabilities of the machinery or accumulator. It has not been thought worth while to give the bare cost of the engines, dynamos, etc., since these are easily arrived at by consulting the makers' price lists.

Before concluding, it may be well to give a practical

example taken from the Broomhill installation. The cost of one part of it capable of lighting 200 16 c. p. lamps with ease, with accumulators for 150 lamps at a time for ten to twelve hours, perfect governors and every part of the installation absolutely automatic has reached some £2,000. (The total cost has been approximately £6,000, but this is for a duplicate arrangement, extra dynamos, experimental apparatus, motors and other items.) Therefore, the initial cost has been £10 per lamp. Sinking fund and interest is placed at £200 a year, the whole time of a good engine driver, £75 a year; oil, waste and repairs, £25 annually. The coal consumed all the year round, that is for 2,000 hours, and always for 150 lamps, comes to 2 cwt. an hour, or a total of £200. The coal actually costs 18s. 6d. to 19s. a ton, delivery extra. Hence the total expense for 150 lamps per 2,000 hours is £500, but to this must be added boiler insurance, £10, and the cost of 150 lamps, making an addition of £47 10s., say £50 with carriage and other incidental expenses; in all, therefore, £550. The governing arrangements permit the life of each lamp to exceed 2,000 hours. Thus the yearly cost per lamp is £3 13s. But in practice so many lamps are rarely used at once, nor is the installation used all the year round: a saving is thus exercised which has rendered the electric light really far cheaper than if gas had been employed as a source of illumination.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Nov. 14, 1887.

The new cruiser "Chicago" is now at the Brooklyn Navy Yard, where she will remain six months. She has received her Edison electric light plant of two dynamos, each of 350 lights. There are 450 lights on board, and in case of emergency either machine will carry the full load. The dynamos are automatic, compound wound, so as to run one light or the full complement. Each lamp is fitted with a water tight Edison cut out, and all the switches are also watertight. About 40,000 feet of Nos. 6, 8, 10 and 14 Habirshaw wire with led covering have been used in running the circuits, and I know of few more difficult pieces of work than such a job of wiring. The wooden moldings are all set up on the steel hull and partations, etc., so that the wirers had to bore into the steel to get a "gain" for the woodwork, and I am told that over 55,000 holes have thus been bored. There are no splices in the wire throughout the ship. Edison lamps of 10, 16, 32 and 50 c p. are in use. According to the specifications there is an insulation of 1,000 ohms for every volt of E. M. F., and a test made by Messrs. Buehler & Bateman, 2 West Fourteenth street, Edison agents for Connecticut and Rhode Island, showed the resistance to be about 100,000 ohms throughout the vessel. The plant is run by two special Armington & Sims engine, 12½ × 10. Buehler & Bateman are the firm who fitted up Elbridge Gerry's yacht "Electra" with over 200 lights, including a number strung on a pliable cable, which can be hauled up on the masts and stretched from bowsprit to stern, for illuminating purposes.

An Assembly committee has been at the Iron and Coal Exchange for some days investigating telephone matters. Mr. Ainsworth is chairman. The committee has looked into the affairs of half a dozen companies, but has learned nothing new. It caught a tartar in Mr. W. N. Estabrook, of Elmira. Mr. H. L. Storke gave some evidence in good shape about his companies. He expressed his opinion that the parent company's royalties were too high and too heavy, and came out in favor of the toll system as opposed to the flat rate. He considered 25 to 33 per cent. of the business done over the telephone to be deadhead. Messrs. W. A. Hovey, C. F. Cutter and J. C. Clark have also been examined. The Metropolitan Company is reserved for the last, as a sort of *bonne bouche*.

Mrs. E. N. Gaillard is the inventor of an ingenious combination call bell and speaking tube, designed for all kinds of vehicles, so that communications can be easily made. Mr. A. T. Smith, 6 West Fourteenth street, is making models.

Mr. A. F. Hochstadter, the well-known clothier of 457 Broadway, is at the head of the New York Electric Mail Box Company, whose system is on view at the Electrical Exhibition. By this system notification is given at any desired place of the fact that mail matter has been deposited in one's letter box. The cost is less than two cents a day. The device ought to be indispensable to those who dwell on the top floors of our lofty and palatial apartment houses, and in any situation it serves as a security against the theft of letters.

The Brush Electric Company, of Cleveland, has issued a circular, in which it says:

"We shall soon open our new Eastern offices in New York, and in the meantime all orders and general correspondence from parties in the former Brush-Swan territory should be directed to William F. Swift, Secretary the Brush Electric Company, Post-Office Box 1,772, New York City. Persons living in Pennsylvania or New Jersey, in the territory contiguous to Philadelphia, who find it more convenient to do so, can communicate with our Philadelphia office, which is in charge of Mr. Edward W. Tisdall, and is located on Third street, near Chestnut, in Philadelphia. We will be pleased to receive orders for the winter's carbon supply from all users of electric lights, and having lately enlarged our carbon department, we can supply with promptitude Brush carbons, which are so justly regarded as superior to all others in the market. No orders will be recognized by us hereafter when coming through the Brush-Swan Electric Light Company, of New England."

In view of the great number of accidents from persons getting caught in running machinery, and more particularly of the distressing occurrence of Wednesday night, by which Mr. Shelbourne was by his own inadvertance instantly killed by the fly-wheel of an engine in the American Institute Exhibition, President Grimshaw of the Polytechnic Section of that Institute, has appointed a committee to consider the question of such accidents, their causes, and the best means of preventing them and of enforcing such preventions. This committee consists of Mosher A. Sunderland, Chairman; Jarvis B. Edson and Owen Boylan. It is what might be called a working committee, and is composed of very practical common sense men. At the meeting of the Polytechnic Section Thursday evening, Nov. 10, a number of inventions were described; among them Schieren's new leather link driving belt. Mr. Thos. D. Stetson spoke upon the subject of "How to Learn and Teach a Trade," and there was a very interesting discussion upon that important topic.

Mr. E. Holmes, of 518 Broadway, has a display at the Institute Exhibition of his various appliances in the line of burglar-alarm work, hotel and house annunciators, etc.

Mr. William Euclid Young, stock broker at 65 Broadway, who is very patriotic, and who is working to bring about a world's fair in New York in 1892, is secretary of an organization which has begun action to induce the government to get control of the telegraph lines in this country. This organization is sending out a circular asking the recipients to signify their approval of a petition to Congress asking for the enactment at the approaching session of such laws as will place the telegraph system under the control of the post-office department. As reasons why it should de done, the following arguments are advanced: Since the absorption of the Baltimore & Ohio Telegraph Company by the Western Union the companies now in operation have arranged to increase the rates from 50 to 150 per cent. All private and important messages should be sacred, and no man or set of men should have the power of holding back such message for his or their personal use or benefit. The telegraph system of the United States is a natural adjunct of the post-office department, and as such should be the property of the people, and in charge of that department, and the expense of telegraphing would be reduced to one-quarter the present rates. The entire telegraph system of the United States can be duplicated for $30,000,000, so as to reach every post-office in the country. The system here recommended has been found to work admirably in England, where it has been thoroughly tested. Such is the line of argument.

I met a day or two ago Mr. S. H. Willard, whose large and varied experience in the manufacture of brass, copper, nickel, silver and other ware has brought him in contact with all the prominent buyers in this line. He is now the treasurer of the Wessell Metal Company, with store at 232 Canal street, and factory at 521–523 West Twenty-fourth street. This concern is largely interested in solid nickeline silver, brass, copper, and German silver, in sheets, rolls, tubes and wire.

Mr. Aug. Hendricks has lately opened a factory at 203 Centre street, between Grand and Howard, for making edged tools of all kinds. He has lately introduced a new single and double-edged grooving tool for electricians, wiring and construction companies, etc. Mr. Hendricks has facilities for making all kinds of Stubbs steel tools for the trade, and gives attention also to grinding, polishing and buffing.

Mr. Curt W. Meyer, 357 Fourth avenue, the manufacturer of school and medical electrical apparatus, is about to retire from the business, and a good chance thus offers to lay in a supply cheaply of such goods as he deals in—motors, Grenet batteries, etc. Students may find this an excellent opportunity.

The air brush at the American Institute Exhibition naturally attracts a good deal of attention. It is an apparatus for applying liquid color by a jet of air, and its mechanism is simple, there being but three parts—air pump, air reservoir and hand piece. The effects produced are at once the broadest and the finest, and, if the hand that wields the brush is at all artistic, the resultant picture is often admirable in its delicacy of execution and finish, effects being obtained possible with no other process. I have no doubt that the air brush is destined to enjoy great popularity, and I am equally confident that it will be found best to operate the air pump by a small electric motor. Mr. J. L. Walkup, the New York manager of this system, has exhibition rooms in the building, southwest corner of Fourteenth street and Fifth avenue. Mr. Walkup is an artist of no mean repute, and can wield the brush with professional skill. There are exhibited at his rooms some of his handiwork, and electricians can have their handsome features put on canvas or paper at a reasonable price, to show the merits of the system.

Mr. A. F. Mason, the general manager of the Simplex Electric Company, of Boston, was in town this week, looking up the interests of the company here. He reports a remarkable success in the sales of the simplex arc lamps for incandescent circuits—and I hear from other sources that a number are now working well on alternating circuits. Mr. F. E. Kinsman, of the Electrical Construction and Supply Company, 145 Broadway, is the Simplex representative for the Middle States, and has to record a great demand for its wire. He shows one piece of a tree where the bark has been literally sawn off and the wood worn smooth by the Simplex wire that rubbed against it. The wire itself has not suffered in the least, beyond a slight abrasion of its outermost coating. Mr. Kinsman's company handles the Simplex lamp, I may add, for the United States, excepting New England. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Nov. 14, 1887.

Mr. Dan R. Russell, of the Parker-Russell Mining and Manufacturing Company of St. Louis, manufacturers of "Sunlight" carbons, was in Boston last week.

Messrs. Pettingell & Armstrong, who established an electrical and electric light supply agency in this city, have taken the Northeastern agency for the Parker-Russell Mining and Manufacturing Company for the sale of the "Sunlight" carbons.

The Eastern Electric Cable Company, of Boston, manufacturers of the "Clark" wire and cables, are reported to have trebled the manufacturing capacity of the works since the first week in August. So busy with orders are the company that that the employés are at work evenings.

The Thomson-Houston Electric Company had a hearing before the Lynn (Mass.) Aldermen on Tuesday evening, Nov. 8, on its petition to operate an electric railway on Centre street, that city. The aldermen were apparently well pleased with the proposition, and it is expected that the requested permission will be granted at an early day.

Supt. A. H. Chapman, of the New England Telephone and Telegraph Company, of Boston, has just made contracts with the Arlington mills and the Russell Paper Company to connect their offices in Boston with their mill at Lawrence by telephone, a private line being run in each case.

The Boston Electric Club will hold a meeting at its rooms, No. 66 Boylston street, Thursday evening, Nov. 17, when Prof. Charles R. Cross will read a paper on "The Acoustic Principles Underlying the Art of Telephony."

Some time ago the projectors of an electric street railway in the town of Quincy, Mass., petitioned the selectmen for a location for tracks, which were to be laid with T rails. The selectmen granted the location, but stipulated that flat rails should be used. The railroad company, finding that the laying of the flat rail will be much more expensive than the other rail, owing to the paving necessary, have voted to petition the selectmen for a rehearing of the matter.

Poles are being erected and wires strung between Augusta, Hallowell and Gardiner, Maine, preparatory to illuminating the streets, stores and residences of those cities with the Brush-Swan electric lights, for which a station is being built in the first-named city, to utilize the water-power at the Augusta dam.

A dispatch from North Adams, Mass., to the Boston *Evening Transcript*, under date of Nov. 11, reads as follows: "The Frank S. Marr Construction Company is preparing to put 1,250 incandescent lamps into the Hoosac Tunnel. They will be placed about twenty feet apart, the line alternating from one side of the tunnel to the other, so that half the number will be on each side. The Westinghouse alternating system will be used."

Advices from Worcester, Mass., report that the Washburn & Moen Manufacturing Company, of that city, is erecting an additional building adjoining its works, the dimensions of which are to be 78 by 128 feet. As soon as the addition is completed the company will go ahead with its new process of tempering wire.

The Cunningham Iron Works Company, of Boston, has been awarded the contract for ten 72-inch steel boilers for the Hamilton Woolen Company, of Amesbury, Mass., and also four 72-inch boilers for the Hartford (Conn.) Electric Light Company.

Telephone stocks on the Boston market closed on Saturday, Nov. 12, as follows: American Bell Telephone, 219; New England Telephone, 40; and Erie Telephone, 32.

The Boston Sunday *Herald* (Nov. 13), referring to the American Bell Telephone Company, said: "Bell telephone gained 1 point to 220 and lost it again. It is gossip that there would have been another extra dividend declared this month if the United States Supreme Court decision had been on time and of a favorable description. The company is earning some 23 or 24 per cent. on its capital."

The Boston *Daily Herald* of Nov. 11 contained the following interesting description of the new long-distance line between Boston, Washington and the West:

The Bell Telephone Company has had a large force of men at work during the past summer constructing long-distance telephone lines all over the country, or rather from Boston as far west as Cincinnati and Chicago. But little has been made public concerning this important work by the company, as it was first desired to run the lines. The system of long-distance telephony mapped out by the company is a gigantic one, and will in time undoubtedly rival the telegraph as a means of quick communication between cities at a considerable distance from each other. One important branch of the system is very nearly completed so far as its construction is concerned. That is the line between Boston and Washington, which also includes the cities of Worcester, Springfield, Hartford, New Haven, New York, Philadelphia and Baltimore. In a short time experiments will be made over this line to determine its exact value as a means of communication. The company has no reason to doubt the ability to satisfactorily telephone to all these places from any one of them, as it has improved instruments capable of transmitting the human voice by telephone over an almost unlimited distance. The only problems to be solved are those of best methods of construction and operation. Experiments at long-distance telephony which have so far been made by the company have been highly satisfactory. The longest distance covered experimentally, it is stated, has been between Boston and Philadelphia. For practical business use, however, the longest distance covered has been between Boston and Springfield, but then no attempt has been made beyond that. The system connecting the Western cities has not progressed so far toward completion as the line between Boston and Washington, but work upon it is rapidly going on, and it will probably be done by spring. This system will take in Chicago, Cincinnati, Cleveland and all the large cities north and east of them. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., Nov. 14, 1887.

The negotiations on the part of the Chinese government and Mr. Wharton Barker, as the head of the Philadelphia syndicate, by which extensive telegraph and telephone lines and other public works will be constructed, have been satisfactorily and definitely settled, and the special envoy of the Chinese Government, Ma Kie Chang, has returned home by the Suez Canal route. It is stated that work will be commenced at once, as the capital is ready. Several American telegraphers will probably take their departure before long for the Flowery Kingdom.

Messrs. James W. Queen & Co., of this city, who have the finest exhibit of instruments at the New York Electrical Exhibition, have just issued a handsome and profusely illustrated catalogue and price-list of the electrical instruments handled by the firm, and interested parties will do well to avail themselves of the opportunity of obtaining one. This branch of Messrs. Queen & Co.'s business has, under the judicious management of Mr. Walton, increased to immense proportions, and as they control the sale in this country of several leading makes of foreign instruments, they will undoubtedly find it necessary to still further increase the size of this department.

A special telegram from Lebanon, Pa., states that the application for a charter which was made to the State Department at Harrisburg, by the Electric Street Railway Company, of that place, has been refused. The State Department based its refusal upon the ground that the city already had one street railway, and that it was entirely sufficient to accommodate all the business of the place. The matter may be taken into the courts to test the legality of the Department's refusal to grant the company the necessary charter.

Mr. George W. Lord, the manufacturer of the well-known boiler compound, has ready for distribution to engineers and others interested a neat and useful little book on the care of boil-

ers, which every engineer should have. Mr. Lord also furnishes a book of "Useful Hints and Information for Steam Users," with rules for engineers and firemen for the management and care of steam boilers, published by the J. N. Mills Publishing Company, of New York; and to the purchasers of a barrel or more of his compound he gives a choice of eight different works, ranging in price from $2.50 to $3.50. These are standard books, and are a very liberal offer to engineers and firemen.

The sub-committee of City Councils, to which was referred the matter in regard to the suing out of the bond of $50,000 of the Baltimore & Ohio Telegraph Company, because of its merger with the Western Union, has prepared a report recommending that the City Solicitor enter suit as speedily as possible, so that the courts can decide upon the points of law raised by the corporations. The full Law Committee will act upon the matter at its next meeting, at which Superintendent Gill, of the Western Union, was directed to produce all letters, telegrams, or other communications upon the subject.

Upon complaint of Common Councilman John H. Fow, Director Stokley, on Saturday, ordered Lieutenant Brode, of the Reserves, to stop the workmen of the Edison Electric Light Company from laying conduits on Walnut street. The Edison Company claims to have obtained its right to dig trenches and place underground conduits on Walnut street from the Pennsylvania Electric Company, but as the charter of the latter company contains no provision for sub-letting its privileges, the authority under which the Edison people were acting was questioned, and so the work was stopped. It is prescribed in the charter that no trench shall be opened to a greater length than 500 feet, but to hasten operations the workmen circumvent this obnoxious provision by digging several sections at the same time. When a member of Councils called the company's attention to this violation of the charter provisions he was told by the officers that they were not restricted in the number of trenches to be dug at a time so long as none of them was more than 500 feet in length. While the work was progressing the Walnut street sewer was tapped in two places, once at Ninth street and again at Eighth street. The repairs were made by the company.

The Sawyer-Man Company have over 2,500 of their incandescent lights in use here.

A. J. De Camp, secretary of the Brush Electric Light Company, is kept very busy with electrical affairs.

The Edison Electric Light Company, of this city, have purchased property on Sansom street above Ninth for the erection of their first station.

The Philadelphia Time Telegraph Company have 378 of their electric clocks in operation here and are about to open a branch office in Atlantic City.

The Edison United Manufacturing Company have about twenty-one plants installed in this city, with a total lamp capacity of nearly 9,000. They operate under 345 patents granted to Edison and others.

The United Lines Telegraph Company operate twenty-nine wires (two routes) between this city and New York, twenty wires to Chicago and seventeen to points South. This company is the only rival the Western Union Company now has.

The Bell Telephone Company of this city have increased their business greatly during the past few years. In 1879 they had but 626 instruments in operation here; in 1880, 1,578; in 1881, 2,365; in 1882, 2,606; in 1883, 2,896; in 1884, 2,946; in 1885, 3,161; in 1886, 3,563, and at present have 3,822 in working operation.

An electric heater, which two young electricians of this city spent much time in constructing, was found when completed to be too expensive for general use, and they are now working to reduce the cost. Patents have been granted, and if machines can be cheaply made they have a valuable machine. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Nov. 12, 1887.

A judgment has been rendered against the Inter-state Telephone Company, in favor of Mr. A. C. Knapp, for $3,283.

The Inter-state Telephone Company use the Hopkins telephone, which instrument, by the way, is said to use a "make and break" current instead of an undulatory current as in the Bell. This argument has been used repeatedly, and forms the basis of all of the new telephone devices which have been brought out in this territory, and upon the strength of which thousands of dollars have been invested. And this reminds me to report that the Barriett telephone is to be brought out by a company shortly.

I understand that the evidence has all been taken in the case of the American Bell Telephone Company vs. American Cushman Telephone Company, and that the case will be called in court this fall.

I clip the following from a local paper:

Nathaniel Banks Cregier, son of De Witt C. Cregier of this city, has perfected an invention for a system of electric signaling between trainmen. It is claimed to be impracticable to maintain electrical communication between the cars of a train and an engine, where a battery is the source of the electricity. Mr. Cregier's method provides for a magneto-electric generator and a call-bell for each car—passenger, mail and baggage—and for the engine cab. A flexible cord carrying two metallic conductors is strung from one end of the train to the other. Connection between cars is effected by a "spring plug" or metal clip, which is so devised that the circuit is automatically closed in case of accidental or desired separation of sections of the train. A complete circuit is thus assured. A code of signals has been devised whereby almost any desired information may be transmitted from the engine cab or any car to all the other cars. The uses to which this system may be put easily suggest themselves to railroad men. Mr. Cregier has had associated with him in the evolution of the idea Mr. John Fitzpatrick, a telegraph operator in the fire-alarm office at the City Hall. Superintendent Miller, of the Northwestern, to whom the young men explained the nature of their device, was favorably impressed with it, and a train is being fitted up for an experimental test. The result will be watched for with considerable interest by railroad men.

Efforts are being made to organize a company to handle the "writing telegraph" in this city.

The city ordinance which prohibits aerial wires under any conditions, and underground conduits except by special ordinance, has seriously interfered with all electrical enterprises in this city. Alderman Manierre of the City Council was asked the other day the question as to the difficulty, if any, that would be experienced in getting these special ordinances passed. The Alderman stated that the expense for attorney's fees and diagrams would be great, and he did not believe that the present council would grant any such franchise. As the matter now stands, a concern owning a plant cannot put in underground conduits across a street or alley, but must confine their range of lights to the adjoining buildings. The result is that the plants sold are fewer in number and of smaller capacity than they otherwise would be.

The Western Electric Company state that they will furnish the lights for the coming Fat Stock Show at the Exposition Building, although we haven't heard what Contract Agent Simpson will do.

The Mather system is giving excellent satisfaction in the Western States. Comparatively few months ago the Mather Company had only a few scattered, isolated plants in this territory, while to-day their system is in use in many of the largest buildings in the West. Since Agent Reid installed the first plant in St. Paul he has secured contracts for lighting many of the largest buildings in that city and Minneapolis.

A young man recently attempted to stop a ventilating fan at the Brunswick saloon, which was being driven by a Bain motor. He now mourns the loss of three fingers.

The Board of Managers of the Chicago Electric Club announce that arrangements have been completed for serving lunches and refreshments, and it is hoped that members will avail themselves of this accommodation.

Among the novel contrivances that have been brought out for propulsion of street and railway cars by electricity the following, the invention of a Chicago man, deserves a place: The motor, although simple in construction and principle, is gigantic in proportions. It consists of an electromagnet of enormous weight and dimensions, an extra heavy truck and platform having been constructed for the purpose. A series of plates or "keepers" have been affixed to the axles, which are attracted by the action of the magnet, thereby producing continuous motion. The great difficulty thus far lies in not being able to discharge the magnet rapidly enough for fast speed. Seven miles an hour have been attained with an ordinary street car load attached.

The excitement in this city attendant upon the execution of the anarchists was without parallel since the great fire. All of the large buildings, especially the government and municipal, were heavily guarded day and night. Troops were quartered several blocks away from the expected scene of trouble, and no difficulty was feared by the cutting off of the usual telephone and telegraphic means of communication on account of the underground wires. This is a matter of vast importance in the case of a riot in a large city.

The Chicago Electric Club met last Monday evening, and listened to Mr. Sunny's paper upon the "Effects of Electric Light Induction Upon the Telephone," which appeared in last week's WORLD. A large number of inquiries were made relative to the subject, and the opinion seemed to prevail that the question of induction in its different aspects could well form the subject of future papers. The matter is of great importance to all of the electrical interests.

The paper at the next meeting, Nov. 21, will be read by Mr. C. J. Van Depoele.

St. Joseph, Mo., has formed an electric club, with W. C. Stewart, Superintendent St. Joseph Arc Light & Power Co., as President.

The Board of Trade of Indianapolis, Ind., have undertaken to form a syndicate of capitalists for building a natural gas plant. They claim that the Standard Oil Company has secured a monopoly of the gas business of their city. Indianapolis has enjoyed a mild "boom" lately, and now that manufacturers realize that the cost of natural gas will be largely in excess of the original figures, the appreciation of property has come to a standstill. The proposed relief is through a well and plant owned by the citizens.

The tower system for overhead wires is still being agitated in St. Louis, Mo.

The Railway Telegraph Supply Company is putting up a display board in its office, adorned with samples of the manufactures of this company.

This company makes a specialty of single core annunciators, the demand for which is constantly increasing.

The Hawkeye Electric Company, of Oskaloosa, Iowa, are putting in a large number of plants in the West. Their plants are giving satisfaction.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following quotations upon telephone stock:

	C. H. M.
Bell of Mo.	$160@$165
Central Union	44@ 45
Chicago	375@ 390
Colorado	18@ 20
Cumberland	80@ 85
Great Southern	30@ 32
Iowa Union	20@ 30
Michigan	76@ 77
Missouri and Kansas	68@ 69
Rocky Mountain Bell	40@ 45
Wisconsin	108@ 109

SOUTHERN NOTES.

NEW ORLEANS, Nov. 3, 1887.

New Orleans being the first city in the country to adopt the tower system for electric wires, the work is watched with considerable interest.

In the case of the New Orleans Gas Light Company *vs.* Maurice J. Hart, defendant Hart has filed an interesting response to the injunction of the gas company. He urges: "That owing to the rapid advances made in the use of electricity for the purpose of rapid communication, illumination and the furnishing of power in limited quantities for various uses, the number of wires used for the purpose of conducting currents of electricity about the streets of this city have increased so rapidly as not only greatly to injure the appearance of the streets, but as also to cause frequent accidents to life and limb from certain of said currents of electricity, and also to render the approach of firemen to buildings for the purpose of extinguishing fires extremely dangerous and difficult; that the damages and inconveniencies from said wires have become so great as absolutely to necessitate some remedy, and that said remedy can only be had either by placing said wires underground or raising them to a height so great as not to interfere with any buildings or with any of the ordinary uses of the streets.

"That the City of New Orleans, recognizing the evils and damages from said wires, has passed an ordinance providing for the erection of and construction upon the streets of a system of towers or supports, for the purpose of carrying all wires and cables, whether for telephone, electric light, telegraph or other electrical objects, and has empowered and authorized defendant to erect said towers, and that by the said ordinance it is provided:

"'That whenever, in the course of construction or erection of any of said towers or supports, it shall be found necessary to remove or dispose of any post, pole, awning, sign, support or other thing in or upon the public places, defendant shall have the right to remove or displace the same, and to occupy the place or places from which said removal shall have been made.'

"Further answering, defendant says that said towers must necessarily be constructed upon some general system, and that the only practical manner of constructing the same is that which has been adopted by him, and which consists in the construction of a firm base or foundation at each of the four corners of sidewalks at the intersection of streets, upon which bases or foundations strong iron columns are placed, extending upwardly and convergingly so as to form the corners and a main support for a system of cross-arms and braces used in the construction of said towers.

"That defendant lately set about the construction of the towers and began excavations at several points in the city; that at many of the street corners defendant found his work obstructed by sundry gas posts surmounted by lamps, which posts and lamps are the relics of an obsolete system of lighting the streets of the city, which system has been disused for several years past. That the said lamps and posts are, as defendant is informed and believes, the property of plantiff herein, but that plantiff is without any right or authority whatsoever to maintain said lamps and posts at the street corners; that the posts were so placed solely for the use and benefit of the city of New Orleans at a time when gas was used as a means of illuminating the public streets under contracts with the city which have long since expired.

"That after the disuse of gas the company was without right or authority further to maintain the lamp-posts at the street corners, and that the lamp-posts were so allowed to remain solely by sufferance of the city authorities, and that as soon as the defendant started about the construction of its works under the ordinance of the city defendant notified the gas light company of the necessity of the removal of the posts, and amicably solicited its concurrence and assistance in the removal of the same in such a manner as to cause the least inconvenience to the gas company, but that plaintiffs, rejecting all the efforts of the defendant to remove the posts with the least possible inconvenience to plaintiff, failed to answer defendant's communication or in any manner to heed the same."

Defendant further says that he has not intended to in any manner interfere with the mains or pipes of plaintiff, but defendant has intended to and will construct said foundations with an arch over said mains in such a manner that said foundations shall not touch said mains, and shall allow reasonable, safe and convenient access to the same.

"Defendant refers to a duly certified copy of the contract entered into between him and the city pursuant to Ordinance No. 2,155, C. S., showing that under the ordinance defendant has obligated himself in the sum of $25,000 faithfully to carry out his obligations under the ordinance, and that the city has by said grant warranted to him the right of constructing the towers, and the city is therefore a necessary party to this suit, both as a warrantor and in order to protect defendant from any suits by the city under the contract in the event that the judgment should be against him.

Mr. Hart in conclusion prays for a dismissal of the suit, and that his right to sue by reason of the illegal issuance of the injunction herein be reserved to him, and assuming the character of plaintiff in reconvention, he prays for judgment in his favor, ordering, adjudging and decreeing that this defendant under said ordinance has the right to remove all gas posts and lamps which may interfere with the construction of the system of towers provided for by the ordinance, and ordering plantiff from time to time and upon such reasonable notice from defendant as the court may seem proper to remove the gas lamps and posts as well as all pipes connecting the same with the mains of plaintiff's company from such points as may be indicated by the defendant, and as may interfere with the prosecution of defendant's work; and further, he prays that this court order and decree that he has the right to construct the foundations of said towers over the mains and pipes of the plaintiff's company, provided the same be constructed in such a manner as not to interfere with the mains or with the reasonable, convenient and easy access to the same, said foundations to be constructed with arches over the mains so as not to come in immediate contact with the same. Defendant further prays that the city be made party to this suit as defendant's warrantor, and that whatever judgment be rendered against defendant be also rendered against the City of New Orleans.

Commissioner Mealey has notified the Superintendent of Fire Alarm to remove from housetops all the dead wires which are considered a nuisance by property holders.

Manager J. T. Alleyn, of the Western Union Telegraph Company, this city, has received orders to close the offices of the Mutual Union, which order was immediately executed. Manager John Feehan, of the Mutual Union, will be given employment in the Western Union office.

In City Council last night a resolution was introduced authorizing and directing the Mayor to contract with the Louisiana Electric Light and Power Company for seven electric lights in the fifth district.

THE TELEGRAPH.

The Upward Turn.—Receipts of the Western Union Company's test offices for last week, exclusive of Baltimore & Ohio, were about $217,000, an increase of $43,000 over last year.

A Newly Laid Cable.—A special dispatch from Halifax of Nov. 1 says: The circuit of the short cable between Halifax and

Rye Beach, N. H., of the United States Direct Cable Company, has been completed, the land end having been taken up at Torbay and removed here. The line gives the utmost satisfaction. The cable was laid over Brown's Bank, but to avoid any interference with fishermen plying their vocation the steamer Minia was employed to lay the cable around the bank instead of over it.

THE TELEPHONE.

Germany and the Telephone.—Some time ago the closing of telephonic communication between Mülhausen and Basle created considerable sensation. The alleged reason was that alarming news regarding the movement of troops on the German frontier was transmitted by it from Basle to Paris. Now the imperial Post-Office has refused to fulfill its former promise of establishing a telephone between Verviers and Aix-la-Chapelle. Probably this is done to avoid the occurrence of an incident similar to that which happened at Basle. Public opinion condemns this step very strongly. If, in consequence of news about the movements of the troops, some speculator in Paris or Brussels loses his money, that is no reason for closing the telephone. With equal reason might the telegraph wires be cut because false news is sometimes sent by them.

THE ELECTRIC LIGHT.

Holton, Kan., is to have an electric light plant.

Wahpeton, Dak., is to put in the electric light.

Cherryville, Kan., is to have an electric light plant.

Fremont, Neb., has awarded an electric light contract.

Albia, Ia., is about to contract for an electric light plant.

Woodstock, Can., has electric light negotiations in progress.

Randolph, Mass., wants more light—of the electric variety.

Ashland, Ky.—Mr. E. M. Roberts is interested in the plant for Ashland.

Thomasville, N. C.—The Piedmont Reduction Company is to put in a plant.

Oconto, Wis.—Mr. Kellogg, of Green Bay, Wis., is putting in a plant at Oconto.

Oneida, N. Y.—Mr. J. W. Warner will put in an electric light plant at Oneida.

Salina, Kan.—Electric lights are to be installed in the business portion of Salina.

Orange, Mass.—Mr. G. P. Warner proposes putting in a plant at Orange, Mass.

Paducah, Ky.—Mr. H. H. Houston and others propose to put up a plant at Paducah.

Fort Collins, Col.—The city has contracted for ten arcs, at $2,000 for the first year.

Dallas, Tex.—Mr. W. H. Flippin has asked for permission to erect an electric light plant.

Chicago, Ill.—An Edison plant goes into the United States Express building at Chicago.

Jackson, O.—Mr. Guy Roft has made a proposition for lighting the town by electricity.

Monmouth, Ill., has closed a contract for lighting with the Edison Electric Light Company.

Independence, Mo.—The sixty-light plant for Independence is from the Western Electric Company.

Lansing, Mich.—Electric lights are likely to be placed on all the avenues around the capitol building.

Brockton, Mass.—The Edison Electric Illuminating Company, of Brockton, has ordered 35 American arc lights.

Sandusky, O.—The capital stock of the Edison Electric Light and Power Company, of Sandusky, is placed at $40,000.

Menosha, Wis., desires to put in a plant. All inquiries and tenders should be sent to Mr. A. L. Lincoln, the city clerk.

Galveston, Tex.—Consolidation is on foot between the Galveston Gas Company and the Galveston Electric Light Company.

East Portland, Ore.—It is proposed to put in an electric light plant at East Portland. Mr. H. Hogue is one of the parties interested.

Catskill, N. Y.—The Canterskill Electric Light Company has been incorporated at Catskill, N. Y., by J. H. Posson and others with a capital stock of $20,000.

Edwardsville, Ill.—The Edwardsville Light and Power Company has been incorporated by C. L. Cook, W. P. Bradshaw and others with a capital stock of $10,000.

Kansas.—It is said that not a town in Kansas of over 3,000 inhabitants is without its electric light plant; and the electric light people are now after the towns under 3,000.

St. Louis, Mo.—The Pike Electric Company, of St. Louis, is now representing the American system for the States of Missouri, Arkansas, Kansas and Southern Illinois.

Columbus, Ga.—The plant to be erected by Mr. T. E. Blanchard and others at Columbus will be of the Thomson-Houston system. Mr. Blanchard is a member of the leading commission firm of Blanchard, Hamber & Co.

Sprague, Wash. Ter.—The Sprague Electric Light Company has not yet determined on its plans. The plant may possibly be run in conjunction with the proposed new water-works; if not, is will be operated as an independent installation.

Ohio River Steamboats.—There is a brisk demand for steamboat lights on inland waters. An order recently placed with the American Electric Manufacturing Company is for 24 one light machines, with focussing lamps of 6,000 c. p. each, for boats on the Ohio River.

Railway Signals.—The United States Electric Railway Signal Company has been incorporated at Ashland, Ky., with a capital stock of $500,000, by J. H. Crook, O. J. Cohn and W. B. Sterrett. It is said that the company's business will be carried on principally in New York.

A Big Order.—The Callender Insulationg and Waterproofing Company has received an order to supply 250 miles of its "Trinidad" wire, to be used for the circuits of the new Thomson-Houston plant in New York City. This is said to be the largest order of the kind ever given.

Easton, Pa.—The committee on incandescent electric lighting returned recently after visiting a number of stations in the State. They report themselves very well pleased with the Edison stations inspected, and there is no doubt that the citizens of Easton will soon bask in the glow of the incandescents.

Elmira, N. Y.—Mr. H. Arnot and James B. Rathbone, with other brilliant but not so wealthy gentlemen, went to the Elmira Reformatory the other evening to see the 2,000 electric lights in the cells, corridors, offices and shops of the great institution burning for the first time. The improvement is the greatest since the institution was founded. It cost the State $20.000. There are now 800 inmates in the reformatory.—*N. Y. World.*

Portland, Me.—The city of Portland closed a contract, on Oct. 31, with the Consolidated Electric Light Company to light the city for one year, every night, from dusk to daylight, with 168 arc lights of 1,200 c. p., and 250 incandescents of 32 c. p., for the sum of $26,000. The Portland Light and Power Company has a petition before the Mayor and Aldermen for permission to set a large number of poles. Its new machines are daily expected.

Electric Light Litigation.—The Thomson-Houston Electric Light Company began proceedings in the United States Circuit Court at Philadelphia, last week, to have the Allentown Electric Light and Power Company, the Edison Electric Light Company, of York, and Jacob Reed's Sons, of that city, enjoined from the using of alleged infringements on improvements in current regulators for dynamo-electric machines to which the complainant, under a patent, claims the exclusive right. The matter will probably be heard upon argument.

American Plants.—The American Electric Manufacturing Company reports the following orders just received: Sandusky, O., Electric Light Company, 50 lights; Clayton, N. Y., 50 lights; Watertown, N. Y., Electric Light Company, 50 lights; Allentown, Pa., Electric Light and Power Company, 75 lights; United States Electric Lighting Company, Washington, D. C., 50 lights; Edison Electric Light Company, York, Pa., 50 lights increase; American Electric Illuminating Company, Carthage, N. Y., 25 lights, increase; A. Whitney & Sons, Philadelphia, 10 lights; Saratoga Gas and Electric Light Company one 25 ampère machine for charging accumulators.

APPLICATIONS OF POWER.

The Cleveland Motor.—The incorporation is announced in this city of the Cleveland Motor Company, by E. B. Gettein and others with a capital stock of $50,000.

Electric Railway at Easton, Pa.—The Lafayette Traction Company, Easton, hope to have their road in operation by Jan. 1. Many people are expressing doubts as to its success, on account of the bad grades to be overcome, but probably their fears will be shown to be idle.

Dayton, O.—The White Line Street Railway Company, of Dayton, O., which is to use the Van Depoele system, has contracted with the Lane & Bodley Company, of Cincinnati, for the complete steam plant and machinery. This plant will comprise two 16 × 42 improved Corliss automatic cut-off engines and three 60 × 16 return tubular boilers.

Ithaca, N. Y.—Ithacans are jubilant over the prospect of having their electric street railway in operation by the latter part of this month. The rails and poles are now in position, and the insulators and Daft motor are expected to arrive next week. Should the road be a success it will be extended to the university campus, thus making the "hill of knowledge" a little easier of ascent than it is at present.—*N. Y. World.*

Niagara Falls, N. Y.—The Niagara Falls Hydraulic Power and Motor Company, Chicago, Ill., has been formed to build a plant on the Niagara Falls to utilize the falling water for power to run dynamos to furnish electric light for large cities and towns, and to furnish electric power for manufacturing purposes over large wires at a distance of 1,000 miles or more. The capital is $15,000,000. The incorporators are K. and E. B. Morgner and E. C. Phillips.

PERSONALS.

Mr. James Jenney, of the Jenney Electric Light Company, has located in Lakeville, and will have dynamos made at the Jencks machine shop, Middleboro.—*Boston Jour. Com.*

Mr. George H. Stockbridge returned recently from England, which country he visited to attend to patent expert work on behalf of a client of Johnston's Patent Agency, of which he is manager.

Address Wanted.—The address is wanted of W. H. Johnson, of London, England, formerly with the Gold & Stock Telegraph Company, by Mr. J. G. Stone lately arrived from London. The address should be sent to Mr. Stone, care of this paper.

S. P. Ma Kie Chang, the Imperial Chinese Envoy who was sent to this country to see whether it would be advisable to grant to an American syndicate privileges for the establishment of a banking and telephone system in China, sailed on Nov. 12 with his two secretaries on the Cunard steamship "Etruria."

Mr. A. McKinley.—For nearly two years a quiet and unpretentious man of perhaps thirty-five, with the smooth-shaven face and general air of priesthood, has been moving in and out among the business haunts of lower Broadway, Wall and Broad streets. Often he may be seen coming from the Western Union Building. His name is Abner McKinley, and he is a brother of Congressman McKinley, of Ohio, the tariff advocate. He is the managing man for a syndicate that is promoting the transmission of telegraphic messages from a keyboard like a typewriter to a machine that prints the message on a paper tape at the delivery end of the line. Of course there are "millions in it" if it is put into general use. *N. Y. Tribune.*

Mr. John A. Barrett, whose success in the field of telephony and other electrical branches is well-known, has for some time past been engaged in the simplification of electro-medical apparatus, and the results already obtained by him give ample evidence of his capacity for original work. Mr. Barrett has paid particular attention to the question of a suitable medical battery, and, after a close study, has decided upon the chloride of silver cell as the most suitable for this purpose. With the improvements introduced by him, the new form of cell will find applications which it has not hitherto enjoyed. Though still a young man, Mr. Barrett has shown himself to be an electrical engineer of great ability, and the work he is now devoting himself to will undoubtedly add to his growing reputation.

Mr. O. E. Madden, of Boston, who was for a long time assistant general manager of the American Bell Telephone Company, is now engaged in various electrical enterprises, and also in promoting a hot water heating company at the Hub. He is frequently in New York, and in a chat yesterday he said that the hot water system promises great success. The water is heated to a high degree and then driven at great velocity through distributing pipes over the city. It is utilized by means of converters located on the premises where it may be desired either as heat or steam. The water waste is returned by separate pipes to a large vat from which it is taken back to the boilers, and again sent on its mission over the city. The water when returned retains a heat only 1 to 5 per cent. diminished. The system has been imperfectly applied in Washington, but has the advantage in Boston of scientific construction, with every perfection of detail that large capital can command.—*N. Y. Tribune.*

Mr. Jay Gould.—A special cable from London, of Nov. 12, says: Jay Gould left London this morning for Paris, where he will await the arrival of his yacht at Marseilles. Previous to leaving Mr. Gould again protested to all the press men who called on him that his visit was one of recreation only. During the week I have taken no notice of many rumors which Gould's presence here has set afloat. Some were as unsubstantial as the sundown of a dream. Others were launched for stockjobbing purposes only. It now, however, appears quite certain that during the week strenuous efforts have been made by the little financier to list the Western Union, and that his efforts are about to be successful. It is stated in many quarters, the opinions emanating from which rarely coincide, that on Thursday last Mr. Gould disposed of several large blocks of Western Union at six points below the the American quotations to J. G. Morgan & Co., Brown, Shipley & Co. and other well-known banking firms here, in return for their good offices in securing the listing of his stock on 'Change.

STOCK QUOTATIONS.

The following list, compiled by Mr. J. S. Stanton, 16 and 18 Broad street, gives the current quotations of electrical stocks:

Nov. 15, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	30	35
Am. Tel. & Cable	712	722
Cen. & So. Am.	75	.....
*Com. Tel	.....	.....
*Gold & Stock	90	95
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	76	80
Pac. & Atl.	.....	.....
*Postal T. & C.	27	30
South. & Atl.	.....	.....
W. U. Tel.	79	79¼
W. U. Scrip.	77	79
W. U. Bonds	114½	115½
Mut. U. Bonds	84	85¼
TELEPHONE.		
Am. Bell	225	230
Am. Speaking	110	125
Erie	.....	32
*Hudson River	50	55

TELEPHONE.	Bid.	Asked.
Mexican	.....	.....
*N. Y. & N. J.	85	90
N. Y. & Pa.	.....	.....
New England	40½	41
*Southern Bell	.....	.....
ELECTRIC LIGHT.		
*Am. Electric	.....	50
*Brush	.....	100
*Brush Ill.	.....	50
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	165	170
*Edison Ill	80	85
*United States	.....	92
*U. S. Ill.	.....	.....
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

BUSINESS NOTICES.

Change of Address.—The address of the Patent Self-Binding Telegraph Insulator Company, Limited, has been changed from 28 Hamilton street, Birkenhead, England, to Britannia Telegraph Works, Helsby, near Warrington.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Russell Engines.—Russell & Co., Massillion, O., report the following among their sales for October: Tacoma, Wash. Ty., Electric Light and Water Company, a 10 × 16 engine with two 54 × 12 boilers; Brush Electric Light Company, Louisville, Ky., one 10 × 16 engine; Electric Light Company, Kingman, Kan., one 10 × 16 engine with a 54 × 12 boiler; Electric Light Company, Peru, Ill., one 10 × 16 engine.

Johnston's Patent Agency, it may not be generally known, is prepared to undertake any kind of electrical expert work. A considerable amount of such work is done by the agency, and has been for years, and this department of its business is growing rapidly and steadily. The complete set of U. S. electrical patents—drawings and specifications complete—which the agency possesses, and the other facilities at its disposal, enable it to do both expert and patent work of an electrical nature in a thorough and satisfactory manner and at reasonable rates. Correspondence solicited. All communications treated with inviolable secrecy.

This company controls all the Patents for Arc Lighting issued to Chas. F. Brush, of Cleveland, for the New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia, also the Swan Patents for the same territory.

THE BRUSH SWAN ELECTRIC LIGHT CO.,
OF NEW ENGLAND,
204-210 Elizabeth St.,
NEW YORK, Nov. 9, 1887.

The Electrical World, New York:

GENTLEMEN.—In reply to a card in your paper of the Brush Electric Co., of the 5th inst., we hereby notify all persons who are

using or contemplate using the Brush system in this territory, that until the issues between the two companies are decided by the *Courts*, all payments for Brush-Swan Machinery, and all orders for the same, must be made to this company.

BRUSH SWAN ELECTRIC LIGHT CO.,
of New England.
G. MCFALL, Secretary.

The Brush Electric Co.—NEW YORK, Nov. 5, 1887. Dear Sir: Our contract with the Brush-Swan Electric Light Company, of New England, has been terminated, and we have resumed control of the territory formerly occupied by it. Hereafter we will fill orders directly for parties residing in said territory, and all correspondence should be directed to the Brush Electric Company, P. O. Box No. 1,772, New York City. No orders will be recognized by us, hereafter coming through the Brush-Swan Electric Light Company, of New England.

THE BRUSH ELECTRIC COMPANY,
By Wm. F. Swift, Secretary.

MISCELLANEOUS NOTES.

The Edison Phonograph Company, of Bloomfield, N. J., organizes with a capital stock of $1,200,000.

Explosion of Omaha Gas Works.—A special dispatch of Nov. 12, from Omaha, says: An explosion occurred shortly after 3 o'clock this afternoon in the generating house of the Omaha Gas Works. The shock was felt four blocks away. The explosion was caused by sparks from a burning building adjoining the works. Three retorts exploded in quick succession. The Fire Department succeeded in stopping the flames before they reached the main reservoir. The loss is estimated at $30,000. No street lamps are lit to-night, but there is sufficient gas to supply the houses.

Lawrence, Kan.—The Electric Construction Company, of Lawrence, Kan., has been incorporated by C. W. Cook and others with a capital stock of $25,000.

Camden, N. J.—The Bankers & Merchants' Electric Protective Company has been incorporated by T. H. Kimmerer and others with a capital stock of $60,000.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

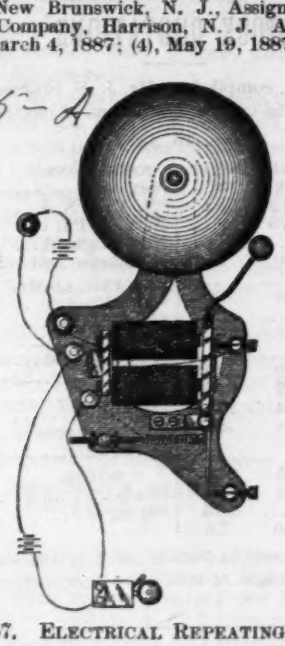
PATENTS DATED NOVEMBER 8, 1887.

(1) 372,657. Electrical Repeating Bell; (2) 372,658. Galvanic Battery; Harry B. Cox, Cincinnati, Ohio. Applications filed respectively March 11, 1887, and May 5, 1887. A bell is located at the same station with a circuit closer for operating a main bell. The latter, when operated, closes the circuit of the first-named bell, and thus automatically notifies the operator that his signal has been properly received. See illustration. (2) A sealing compound consisting of asphaltum and rosin is run into the cell above the exciting liquid and below the top of the carbon and the binding posts. It prevents the escape of the liquid, keeps the elements in place and the carbon exposed. The sealing compound will not melt nor crack at ordinary out-of-door temperatures.

372,720. Process of Making Electric Gold Pictures; Argyle W. Tucker and Elihu M. Tucker, Mansfield, Tex. Application filed Aug. 28, 1885. The process consists in preparing the plate by treating it with chloride of sodium and gum arabic, then washing and drying it, then sensitizing, and expose it in a camera to the light, developing it with a solution of proto-sulphide of iron, acetic acid and sulphate of copper; then washing it and treating it with cyanide of potassium; then washing the plate again; then passing an electric current over the plate and afterward treating it with chloride of gold, and finally washing and drying the plate.

372,734. Carbon Battery; C. H. Wilder, Natick, Assignor to Luke A. Wilder, trustee, Boston, Mass. Application filed April 15, 1887. A tank or jar having a cover provided with suitable attachments for holding the electrodes in the proper position. Also other details.

(1) 372,797. Electrical Distribution; (2) 372,798. Electrical Distribution; (3) 372,799. Electrical Distribution; (4) 373,021. Galvanic Battery; John W. Howell, New Brunswick, N. J., Assignor of (4) to the Edison Lamp Company, Harrison, N. J. Applications (1) (2) and (3) filed March 4, 1887; (4), May 19, 1887. (1) In systems



372,657. ELECTRICAL REPEATING BELL.

of electrical distribution in which two or more feeding circuits extend from a source of supply to a system of working circuits, it has been customary to extend indicating circuits from the outer terminals of each of the feeders to central station, the latter being provided with suitable indicators for showing the potential at the feeder terminals. The invention does away with most of the indicating circuits by employing an absolute indicator in connection with one of the feeding circuits, maintaining the right pressure constant on this feeder, and providing differentially operating comparative indicators which compare the drop or loss of potential in a definite part of this feeder with the drop in a corresponding part of each of the other feeders. (2) Also compares losses of potential on comparative feeders with those on a standard feeder. (3) Puts a balance indicator in connection with the feeding circuit of an Edison three-wire system of electrical distribution to show when the adjustment of the absolute indicators on the positive and negative sides has been deranged. (4) The cell is of the Daniell type and is made of U-shape. The bend of the tube is filled with a paste of zinc oxide mixed with plaster-of-Paris, which afterward hardens and sets. The ends of the cell are sealed with soft rubber tubing secured by wire, the tubes being similarly secured to the electrodes. The objects gained are portability and compactness and freedom from liability of battery liquids becoming mixed. See illustration.

372,805. Telegraphic Transmitter; G. Juengst, Croton Falls, N. Y. Application filed May 27, 1885. A regular keyboard is used. The levers are bell cranks, and carry pins at their lower ends, which engage with notches in a series of discs. The discs have characters or lugs on their peripheries corresponding respectively to the characters on the levers. The discs are rotated by a suitable motor, and when a key is operated, its corresponding disc causes impulses to be sent over the line corresponding to the character which it represents.

372,808. Electro Therapeutic Apparatus; F. J. Kneuper, New York, Assignor to Charles Lembke, Brooklyn, and Ernest Huber, New York, N. Y. Application filed March 29, 1887. This is a small battery which may be suspended from the neck of the wearer, and from it wires are run to bands surrounding the afflicted parts.

(1) 372,822. Dynamo-Electric Machine; (2) 372,823. Electric Motor; (3) 372,824. Electrical Pumping Apparatus; F. J. Sprague, New York, N. Y., Assignor to the Sprague Electric Railway and Motor Company. Applications filed respectively March 3, 1885, April 18, 1887, and June 4, 1887. (1) Both ring coils and cylinder coils are wound upon the armature and connected into a continuous series. (2) A motor and fan are mounted on the same shaft on a single frame, thus constituting a compact device. (3) The motor for running the pumps is flexibly mounted upon a stationary part of the pump and secured upon the pump shaft and having its armature geared to the pump shaft. See illustration.

372,846. Telegraphic Transmitter; W. W. Evans, Washington, D. C. Application filed June 28, 1886. A transmitting board having metallic studs carrying indicator-characters and separated by insulating material, the studs constituting the terminals of separate electric circuits. The conducting and non-conducting materials are permanently united to form a flat, even surface, over which a metallic insulated circuit-closer may slide when driven by the hand of the operator.

372,851. Electrical Current Indicator; J. F. Kelly, Hoboken, N. J., Assignor to the U. S. Electric Lighting Co., New York, N. Y. Application filed Dec. 1, 1886. The improvements consist mainly in the employment in combination with a field magnet of a soft-iron armature plate centrally pivoted between the magnet, and divided up by slots into numerous parts, by means of which the direction of the lines of force is determined and the effects of residual magnetism are lessened. See illustration.

373,021. GALVANIC BATTERY.

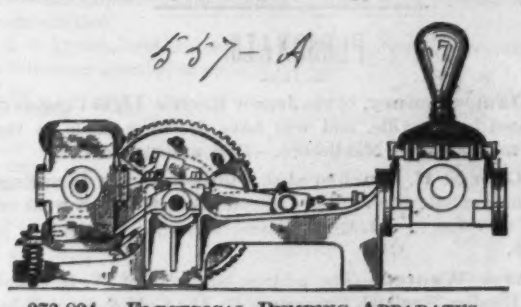
372,860. Resistance Regulator for Electric Currents; G. Montauns, Frankfort-on-the-Main, Germany. Application filed June 19, 1886. The invention consists of a number of wires forming a rheostat and connecting a number of springs with the terminals of the motor and a ring having a segmental flange, which, when turned, connects the first of said number of wires with any desired number of the remaining wires.

372,865. Railway Signal; F. Pearce, New York, N. Y., Assignor to W. B. Sterrett, same place. Application filed Feb. 26, 1887. Two track instruments are arranged at opposite ends of a section, and are adapted to hold the circuit normally open; also, two other instruments are arranged similarly and adapted to hold the circuit normally closed; two electromagnetic signals are located at the ends of the section and a single relay is arranged to hold the circuit either open or closed during the occupation of the section.

372,910. Electric Motor; D. Higham, Philadelphia, Pa., Assignor to the Higham Electric Motor Company, of same place. Application filed Nov. 23, 1886. The faces of the pole pieces are slit or laminated on radiating lines from the axis and transversely to the direction of rotation.

372,926. Cloth-Cutting Machine; Frank W. Nevens, Minneapolis, Minn. Application filed July 27, 1887. A disc adapted to lift the cloth, a vertical standard attached to the disc and a knife reciprocated in a vertical plane by an electric motor are the principal elements of this invention.

(1) 372,934. (2) 372,935. Apparatus and Method of Connecting Alternate Current Generators; (3) 372,936. Pressure Indicating Apparatus and Circuit for System of Electrical Distribution; (4) 373,029. Electric Converter; O. B. Shallenberger, Rochester, Assignor of 1, 2 and 3 to George Westinghouse, Jr., Pittsburgh, Pa. Applications filed respectively Dec. 7, 1886; Jan. 17, March 28, and April 14, 1887. (1, 2) Means for determining the relative phases of two or more electric generators for delivering alternating currents, for the purpose of rendering it possible to bring them together in multiple arc circuit without injury to the circuits which they are designed to supply. (3) Convenient



372,824. ELECTRICAL PUMPING APPARATUS.

and economical means for indicating at a central station variations in the electrical pressure at distant points in an electric circuit. (4) The two coils are wound and insulated separately and the soft iron core is then applied to the two coils.

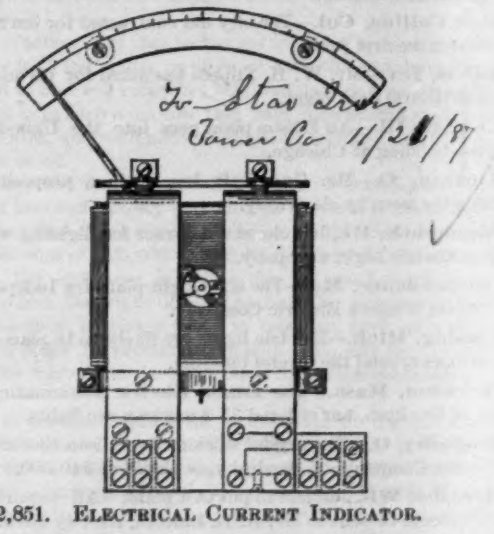
372,940. Insulating Joint; F. H. Soden and H. Goehst, Chicago, Ill. Application filed Jan. 13, 1887. A pair of interlocking loops embrace a ball of insulating material, and lie in grooves in the ball, at right angles to each other, so that if the ball should break the loops would still suspend the lamp.

(1) 372,942. System of Electrical Regulation; (2) 372,943. System of Electrical Distribution and Conversion; (3) 372,944. Method of Electrical Distribution and Conversion; (4) 372,945. Dynamo; W. Stanley, Jr., Pittsburgh, Pa., Assignor of 2, 3 and 4 to George Westinghouse, Jr., of Pittsburgh, Pa. Applications filed respectively Aug. 22, Nov. 23, Nov. 23, 1885, and Feb. 16, 1887. The inventor utilizes for protecting the lamps of an incandescent system the principle that a carbon filament decreases in resistance as its temperature increases. In connection with each illuminating lamp in a group, he provides in a separate circuit a resistance lamp which is automatically switched in when the illuminating lamp is cut out. The carbon of the resistance lamp is so proportioned that it will be heated about to redness by the current which before flowed through the illuminating lamp, and then has a resistance equivalent to that of the lamp switched out. If there should be an increase of current in the main, the temperature of the resistance lamp is increased and its resistance lowered, the latter circumstance causing an increased proportion of the current to pass through it. This continues until the resistance lamp or lamps take up all the excess of current above normal, and so relieve the illuminating lamps. (2) The circuit of the generator includes a differential coil around a soft iron core, and conductors are led off from the ends of this coil and between these conductors lamps are arranged in multiple arc. The lamp circuits form shunts around one-half of the coil. As lamps are cut in, the balance of the coil, or the two halves thereof, is disturbed, and a counter electromotive force is developed in the coil. From this it results that the current generated is always dependent on that consumed by the translating devices. (3) The primary circuit of a "converter" includes such a differential coil as is described in (2), the secondary including translating devices in multiple arc. The action of the coil is as before. (4) A cheap armature-core which shall be free from Foucault currents is the object of the invention. It consists of a frame of cast iron independent of, but carried upon, the shaft of an electric machine, plates of soft iron upon the frame, sheets of non-conducting material between the plates, the cast-iron and piece binding the plates in position.

372,958. Electric Firing Mechanism for Guns and Shells; W. W. Bradley and J. R. Halroyd, Washington, D. C. Application filed Sept. 21, 1886. The projectile is attached to a pair of wires and when in its flight it has gone the length of the wires a circuit is completed which fires the charge in the projectile.

372,986. Regulator for Electric Lamps; S. Mathis, Morlanwelz, Belgium. Application filed Aug. 22, 1887. A combination of levers act on the clutch. One of the levers is of a bell crank shape and carries at one end a shoe and at the other a weight.

(1) 372,009. System of Electrical Distribution; (2) 373,010. Electric Meter; H. M. Byllesby, Pittsburgh, Pa., Assignor to G. Westinghouse, Jr., same place. Applications filed respectively Jan. 10 and Feb. 19, 1887. (1) This



372,851. ELECTRICAL CURRENT INDICATOR.

system renders it possible to readily operate a system of electrical distribution with a difference of potential of either of two different values, as one hundred and two hundred volts, for instance. (2) A coil of wire is wound upon the balance wheel of a clock-work. The coil is closed upon itself, and an electro-magnet acts on the balance wheel.

373,034. Dynamo-Electric-Machinery; H. E. Walter, Clifton, Assignor to himself and C. Batchelor, of New York, N. Y. Application filed Jan. 6, 1887. Means are provided, for starting a dynamo from a distance and for doing the same without passing the whole current through the armature too suddenly.

(1) 373,035. System of Electrical Distribution; (2) 373,036. Automatic Circuit Controlling Apparatus for Systems of Electrical Distribution; (3) 373,037. System of Electrical Distribution; G. Westinghouse, Jr., Pittsburgh, Pa. Applications filed respectively Feb. 4 and (2, 3) March 9, 1887. (1) In connection with a supply circuit an alternate current motor which operates a commutator which serves to rectify or straighten the current. This rectified current is supplied to a storage battery. The current from the storage battery is thus reserved until it is required for supplying the circuit which is normally supplied from the main line. (2) An apparatus for changing the connections of electric circuits, so that in case one the main lines is accidentally interrupted, the apparatus normally connected therewith will be automatically placed in connection with another line. (3) A group of translating devices, each having one terminal connected with one of the main conductors and their other terminals connected with each other, and a second group having one of their terminals connected with the other main conductor, and their remaining terminals connected with the united ends of the other group.

373,038. Converter Box; G. Westinghouse, Jr., H. M. Byllesby, of Pittsburgh, O. B. Shallenberger, of Rochester, and A. Schmid, of Allegheny, Pa. Application filed March 30, 1887. This box is constructed in two parts, one provided with means for securing it to supports and the other having two separate compartments for receiving the primary and secondary circuit controlling devices.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.